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GEORGE BRONSON REA EXPLAINS

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Pending Naval Questions

By ADMIRAL WILLIAM V. PRATT in "Foreign Affairs"

ON December 29, 1934, Japan denounced the Five Power Treaty signed at Washington on February 6, 1922, as part of the general Pacific settlement agreed to at that time by the United States, Great Britain, France, Italy and Japan. According to Article XXIII of the Treaty there must be another conference within a year of its denouncement. Unless all parties to that agreement should decide unanimously not to meet, it therefore seems that a conference must be held before the end of the present year. Will this naval conference include other states in addition to the five original signatories to the Five Power Treaty? As such questions are not settled by majority vote, it would seem that one objection would prevent the inclusion of other states. Even so, the fact remains that the political and military status of other countries has changed since the Washington Treaties were signed, and these changes will have to be taken into account.

Three treaties were negotiated at the Washington Conference, and all were tied together for a purpose. This purpose was: one, to promote world peace; two, to promote peace and fair practices in the Far East; three, to provide security in national defense for all the peoples concerned; four, to reduce their military burdens. In a way, the Five Power Treaty is the sanctions clause of the others. Through it the signatory nations can effect the purpose mentioned without employing force, whereas a single nation in order to attain that same purpose almost inevitably would have to resort some day to the use of force. Despite Japan's special geographical location in propinquity to the mainland of Asia, which confers certain advantages and certain disadvantages, and despite the fact that she is acutely susceptible to disturbing events in the Far East, the pertinent question remains: Can one nation act in the rôle of five and still preserve the purpose of the Washington Treaties, which she claims is her purpose, and do it better than if she had remained an active member of the original group? To break the Five Power Treaty and supply nothing equally good, or to change its character so that it loses its present force, is in effect to damage the entire bloc of Washington Treaties. This inescapable fact is one of the weak points in the Japanese position.

What is the just basis of one state's claim for naval parity with another? In a claim of this sort, if any intent exists which has back of it the principle of aggression, this fact itself prejudices the claim and renders it unacceptable according to the principles established by the Washington Treaties and the Kellogg-Briand Pact. "National prestige" may furnish a popular basis for an insistent plea for parity, but not necessarily a just one. "National security" may or may not be the basis of a just claim for parity. It requires more conclusive proof than its mere statement. After all the technical data has been submitted and weighed, the claim still must stand the acid test of intent.

Does the principle of equality of arms help better to insure peace than does the ratio principle? It has not done so in the past, nor does it seem probable that it will in the future, unless it is accompanied by a genuine intent for peace. Whenever this intent has been absent, and its place taken by fear, suspicion and greed, then equality in arms coupled with free competition in arms has

always shown itself a breeder of war. So long as the preservation of peace is not the governing motive of all the powerful nations, or so long as this motive is hindered from functioning effectively, the ratio principle must stand as a safeguard between peace and war. Abandon the ratio principle, and further advance along the road of arms limitation seems blocked.

Would equality in arms coupled with a plan for reduction of arms offer a better insurance for continued peace than the present limitation of armament scheme based on the ratio principle? Would it be less costly in the end? The answer to both questions is no. Once accept the equality in arms principle as a right upon demand, and it becomes the right of all nations. It is a return to the practices in vogue before the present limitation of arms scheme was tried, bringing into force again the old custom of balances of power. Its tendency is to throw into partnership those states whose motives are aggressive, on the share-and-share alike basis, and to bring together in another group those who seek protection through co-operative action. A struggle ensues between the forces aggressive and the forces protective. When the balance is broken, war begins. The appalling cost of actual war more than offsets any first saving under the "equality-reduction" plan.

Despite the Manchuokuo and Shanghai incidents, and despite the naval discussions which have been going on in London and which have filled so many columns of the press, there is considerable evidence that the main political factors which will determine the course of the coming naval conference are centered to a large extent in the continent of Europe. In 1921-22, when the Washington Conference was arranged and held, Europe was numb from the effects of the late war. The same problems remain in the Orient to-day; but with the revival of the old war atmosphere in Europe, other problems, perhaps even more pressing, demand attention.

Such are some of the political factors which must be taken into consideration when the technical details are fitted into the picture to make it complete.

In devising an instrument to replace the Five Power Treaty, now denounced, two methods of naval limitation are proposed. Which is better, to adopt the so-called "global tonnage scheme," or to adhere to the present method of limitation of total tonnage and numbers in types of naval craft? The debate on this question has waged back and forth. The global theory sounds simpler, and on first thought might appear likely to lead more quickly to a general agreement. But it is open to a serious objection. At best it is only a halfway concession to the principle of limitation of armament. If during a conference on arms limitation the negotiators have in the background of their minds the idea that preparation for war is still more essential than preparation for peace, and if conditions either natural or agreed to impel them to accept a lesser total tonnage allowance than they want, then the tendency of such negotiators would be to prefer the global theory, for it leaves latitude in making adjustments to suit fancied individual needs. But when the total tonnage figures are large, as they must be amongst the foremost naval Powers, there is created within the total envelope an intensive competitive spirit and a spirit of suspicion, the very things which the limitation principle seeks to

avoid. Further, under the global theory there is not that accentuation of type which is one of the characteristics of the present system. If, then, it becomes proper to stress the advantages of one type of ship, or to point out the objections inherent in another, the public mind is not so well prepared to deal intelligently with the matter. Lastly, if in the course of discussion compromise is necessary, it would seem easier and more practicable to adjust the global principle to the present system than *vice versa*.

What is the value of the so-called escalator clause? It has an important function; but that function is not to give one Power an undue advantage over another. Its invocation need not necessarily create the competitive spirit. It is written into agreements in order to provide for unforeseen contingencies which might arise later affecting the national security of a country, and in order to allow that country latitude to meet them. An escalator clause was written into the London Treaty and undoubtedly will find a place in subsequent agreements. It is likely to prove helpful in effecting compromises between different viewpoints.

I shall now try to describe the principal technical differences between the British line of thought and our own. They arise first of all from the general position each country probably would occupy at the outbreak of war; and, second, in the sort of operations each navy would be called upon to undertake in the event of hostilities. The differences in these two respects find expression in different needs as regards types, numbers and size of naval craft.

Great Britain and the United States occupy somewhat unique positions *vis-à-vis* other nations in that both are essentially naval powers and not military powers. But if war breaks out their positions are not the same. British thought must always stake cognizance of the fact that, whatever the cause of the war, or in whatever part of the world it occurs, Great Britain is liable very promptly to become one of the contenders whether she wishes to or not. She has the peculiar distinction—with its disadvantages as well as its advantages—of being of all the Great Powers the foremost exponent of natural sea power. A state possessing "natural" sea power is one whose security and very existence is vested in the sea. Another peculiar distinction lies in the fact that the British Commonwealth of Nations is an entity whose individual members are scattered all over the world. There exists no counterpart of the relationship of each member of the British Empire to other members and of each member to the whole. At the outbreak of many wars which might conceivably arise, the probabilities are that at first the United States would not be drawn in. This fact has led Americans to regard themselves as the Great Neutral in case of war. Britain has inclined to take the far-horizon view; we have inclined to the shorter-range view.

Translating this into naval parlance, we may say that Great Britain takes the view imposed by strategy, while we adopt what might be called the tactical view. Our past experience has been more on the order of the individual ship engagement. The picture Great Britain sees is more on the order of the World Battle. In our individual engagements we have found that ruggedness and strength are all-important factors, leading us to favor these fighting qualities in each type of ship and in each individual of that type. Great Britain of course recognizes these essentials, but her wide-flung world responsibilities force her, in view of treaty limitations on tonnage and in view also of expense, to place an importance on numbers of ships greater than the importance which we give to numbers once our mass or fleet needs are met. We build the biggest and best in each type of ship that the law allows. Our defense problem, in case we are forced into war, tells us this policy is correct. It also fits perfectly the problem confronting us as the Great Neutral.

However, there are also more specific and particular matters which determine our conclusions. Admiral Sir Herbert Richmond in an excellent book which he has just published,* and in his two articles in *Foreign Affairs*,† sets forth at length his thesis that the purpose of sea power could be accomplished just as effectively if the ships constituting the backbone of naval strength, the battleships, and those a part of whose duty it is to serve as the eyes of the fleet, the cruisers, were reduced drastically in size. He makes a very able plea that the cost of maintaining a larger naval establishment would then be appreciably less. This is quite true, and in theory and in principle the argument is sound. British naval authorities themselves, though they do not go to the lengths advocated by Admiral Richmond, still would like to see substantial reductions made in the size of battleships and cruisers. It is the

Admiral's contention that ships grew in size due to the struggle for ascendancy between the gun and armor, and that there is no logical reason why we should not reduce in size immediately.

The problem is not quite so simple. While it is quite true that the rivalry between gun and armor did help to increase the size of fighting ships, it is also true that naval ships grew in size and speed—like the merchant marine, like the machines in industrial plants—due to perfectly natural causes incident to the characteristics of the age in which we live. There also grew apace, to match the times, those auxiliaries of the battleship, the destroyer and the submarine, while their principal weapon, the torpedo, carried ever greater and more powerful charges of high explosive. The deadly mine, hidden under the waters, became a greater and greater menace. Then the aircraft arrived, with its air bombers capable of dropping huge charges of high explosive. Now were it true that any of these auxiliaries—the aircraft, the destroyer, the submarine—could replace the fighting heart of the fleet, the battleship, and its eyes, the cruiser, and still preserve the essentials of sea power, and if it were able to do so at smaller costs than those of the present system, then let them assume that rôle. The history of military art reveals, however, that whatever the first claims be, in the end the fundamental and essential is never replaced by the auxiliary.

To grasp this it might be well to state what the essentials of sea power are. Says Admiral Richmond: "It has consisted in the power to control movements at sea. Sea power is power in that form which enables its possessor and prevents his opponent from moving military forces by sea; which prevents an opponent from receiving, by way of the sea, the goods he needs, either for his people or his fighting forces, and sending across the sea in exchange the goods with which he pays for them." It permits the possessor to do those things which he denies to his opponent. Ever the old and tried fundamentals of war have reasserted themselves and proven true against newer claimants; always the new weapon has proven itself to be the auxiliary—a very useful one sometimes, but auxiliary nevertheless—of the main weapon, the gun; and the ships which carry this weapon are still the main vehicle for enforcing sea power. They live day in and day out in all sorts of weather, keeping their silent watch or prescribing the conduct of hostilities. Despite all the claims its proponents make for it, in a military sense, air power can never replace land-based man power, nor in the naval sense can it replace the fighting heart of naval strength. As to money expenditures, in order to effect the desired results the auxiliary arms have proven themselves more costly in the end. Per ton of efficiency, the battleship is the cheapest naval investment we have, and the longest lived. It has grown in size, and maintains its size, largely in order that it may be able to protect itself against the newer weapons of attack, the torpedo and the air-bomb. By all means let us reduce the size and costs of capital ships whenever possible, but let us know just what we are doing, and let the attempt be made along constructive and not along destructive lines.

Were it not for Great Britain's impelling necessity for numbers, and the attendant cost of constructing the present-size battleships, it is doubtful if the British viewpoint would differ much from our own. Take an assumed total tonnage of 350,000 tons. Out of this may be constructed ten 35,000 ton battleships, carrying 16-in. guns, or fourteen 25,000 ton vessels carrying a less powerful armament both for offense and defense against gun, torpedo, mine or air bomb. Which force do you think the sound naval tactician would choose? Probably the almost unanimous decision under present conditions would be for the ten-ship force; and the disproportion grows as the total tonnage increases. Other factors being equal, the total cost of constructing the ten-ship force should be considerably less than that involved in constructing the fourteen-ship force. Wherein, then, is the American policy unsound in building the ships which American naval men think will satisfy their own needs best?

This answer is nevertheless not entirely satisfactory to those whose needs differ from our own, nor does it meet the desires of

*"Sea Power in the Modern World." New York: Reynal and Hitchcock, 1934.

†"Immediate Problems of Naval Reduction," April 1931; "Naval Problems of 1935," October 1934. Other recent articles on naval problems published in *Foreign Affairs* have been "The Setting for the 1935 Naval Conference," by Admiral William V. Pratt, July 1934, and "Japan's Demand for Naval Equality," by Admiral Kichisaburo Nemura, January 1935.—EDITOR'S NOTE.

those who, while not held responsible for the results of the advice they give, would like to see expenditures curtailed regardless of efficiency. Let us approach the problem, then, from a different angle. Let us imagine that some day, following the plan of limitation of armaments, it might be found possible to abolish the submarine, prohibit the offensive mining of the seas, restrict defensive mining to stated distances off one's own shores, prohibit bombing from the air, limit the size of torpedoes just as the calibre of guns is now limited. In that case the entire picture would change. The principal elements in a battleship to be considered are gun, armor, vulnerability to under-water attack and to attack from the air, and fuel capacity. Speed is not so essential in this class of ship as invulnerability. So long as a ship remains vulnerable to under-water attack, the gun and the armor and the displacement to carry them are matters of smaller moment. This suggests the logical line of approach to the problem of displacement when artificial methods such as limitation by agreement are tried. Considerable tonnage must be builded into a vessel to care for the vulnerability factor. Remove the dangers, and it will be more easily possible to arrive at compromise figures for gun and armor and displacement.

Regarding the cruiser, Admiral Richmond has this to say in the section of his book dealing with overseas bases: "This element of sea power is very far from being a 'mere' matter of abstract principles. It has one particularly practical application, which affects the costs of navies to-day. For three reasons the United States has opposed a reduction in the size of the 'cruisers' to a figure well below that so unthinkingly adopted at Washington." The first two of the objections stated refer to the importance of cruisers in comparison to merchant marine ships, and are subservient to the third objection. The author's statement of our third claim is, "that a nation which has no oversea possessions requires these large ships in consequence of the great distances across which naval action has to take place." This comes nearer to the mark. In all fairness it should be stated that at the time of the Washington Conference we had no cruisers nearly so large as 10,000 tons (our largest was 7,050 tons), but Great Britain did have. So when the suggestion was made to accept 10,000 tons as the upper limit for the size of the individual unit, it was agreeable to us. Somewhat contrary to expectations, we have since developed an excellent vessel. The fact that we do not have any overseas bases where we can overhaul, supply and dock has handicapped us in one of the essential elements of sea power, but we have attempted partially to overcome this handicap by greater attention to the service of transport and supply which, as an army commander knows, is vital to the forces at the front. This inherent weakness causes us to stress greater carrying capacity, greater strength and greater power of survival in each individual unit, to the end that we will have an efficient, compact fighting fleet capable of long-range work. To make amends—if amends be required for the position we take—and realizing fully that a 10,000 ton 8-in. cruiser is probably much better than a smaller one armed with the 6-in. gun, and to compensate those who require more cruisers than we do, we have always been willing to write an adjusting or compensating clause into any agreement, as was done in the London Treaty, whereby those that took more 8-in. cruisers got fewer 6-in. cruisers and a smaller total tonnage and numbers of ships.

In our building programs we have always constructed the largest and strongest in type: we have never believed much in what might be called in-between ships. Some day it may be possible to fix a lower upper tonnage limit for the individual cruiser and return to the 6-in. gun for its armament. But this much is assured: whatever limit is agreed upon, it should be sufficient to give us the cruising radius we feel we need, and of that we are better judges than anyone else. Moreover, the time chosen for this transition should be propitious, for it is these transition periods which cause the naval expert much anxiety.

I have compared our approach to technical naval problems with that of the British. Do any technical differences exist between ourselves and France, Italy and Japan? In the past there have been no differences to speak of between Italy and ourselves. With France we are in general agreement except in the matter of the submarine. Until recently our stand regarding technical matters was fairly well in accord with that of Japan—except in the matter of submarines, where Japan stood with France. Lately Japan has come out with a set of new naval definitions of her own coinage and suited to her own needs, without any special regard to

historical precedent, namely that battleships and aircraft carriers are offensive ships and submarines are defensive. This argument will not stand scrutiny. It is the manner in which these ships are used which makes of them offensive or defensive weapons, and of course any one of them can be used in either way easily.

Is the submarine really the efficient naval craft its proponents claim it to be? At the beginning of the World War the primary rôle of the submarine was supposed to be defensive, that is, it was designed to work fairly close to and in defense of one's own shores. It thus acted much in the manner of a movable under-water mine. Very soon, however, it pushed out and began to act directly against the enemy—that is, in what in technical parlance is known as offensive operations. It sought the enemy, instead of waiting to be sought. It first sought out warships built to fight warships, and in the beginning it was extremely successful. It sank several old battleships and was looked upon as a deadly menace, the counter for which had not yet been found.

But little by little the counter to the submarine was discovered. Listening devices and tracking methods were developed; great numbers of destroyers to run down the submarine were built, these craft also being fitted to drop depth charges, an under-water barrage of mines timed to explode at any required depth; nets and a very deadly form of mine were developed; aircraft came into the picture to spot the submarine and to attack it; large ships had both internal and external protection against the torpedo built into their hulls, making them proof against one or possibly even more explosions. Large ships learned to fan out, instead of remaining as closely bunched as formerly; they steamed at higher speeds, and learned to zigzag instead of following a steady course. When necessary, they learned to obscure their movements by smoke screens. And they were accompanied always by their little protectors, the destroyers. The destroyers, able to dart about at high speed and having light draft, were never themselves in any very serious danger of being struck by the submarine's torpedo; but in turn they became a serious menace to the submarine itself. The tables were turned.

Unable any longer to act efficiently against fighting ships, except largely as a matter of chance, the submarine then turned its attention to the unprotected merchant ships, especially those of low speed. Once again these operations were most successful, and the situation facing the Allies was fraught with great peril, even though against merchant ships of high speed using the proper tactics in submarine waters the percentage of sinkings was not unduly high. Again a partial counter was developed—the convoy system, with protection by destroyers. Owing to the merchant ship's inherent characteristics, the submarine is always a menace to it regardless of what protective methods may be taken. So, too, owing to the submarine's inherent characteristics, the normal target of the submarine in the end becomes the merchant ship and not the fighting ship. In this respect its operations must resemble much the air bombing raids conducted against the unprotected civilian population behind the fighting lines. To build a submarine costs twice as much per ton as it costs to build a ship that floats on the surface, and when it is built its active life is one-half that of the larger ships. If at any time in its career it fails to qualify in a deep submergence test its usefulness is over, and it is liable to become the coffin of its crew. True, it is the one type of ship which can put out when a nation does not control the surface of the sea, and move toward an enemy to gain information; but if it is called upon to fight, its most effective target is the unprotected merchant ship. This is the craft which some attempt to call a defensive weapon. Its record speaks for itself, and is its own condemnation; but if one nation insists upon retaining the type the others must do so in self-defense.

In passing, it might be well to notice that by the London Treaty there was provided, in the exempt tonnage class, a small 2,000 ton vessel of 20 knots speed carrying four 6-in. guns. This craft is handy for the nations with big navies; but it should be especially useful to countries which cannot or do not wish to go in for great naval tonnage. On account of its all-around ability, the latter will probably find it in the long run more serviceable and efficient than any of the smaller special types like the destroyer and submarine.

The aircraft carrier does not seem to present any great problem. Despite the efforts which may be made to do away with the type, it has probably come to stay. Even were bombing abolished,

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U.S. Security in the Pacific

By YATES STIRLING, Jr., Rear-Admiral, U.S. Navy in the "New York Times"

PRESS dispatches from Washington have announced that a large sum of money is to be made available to construct new aircraft bases at several important strategical locations within territory belonging to the United States. These bases, it is declared, are purely for defense and are to provide more secure protection against air attacks.

One of the localities mentioned is in the Hawaiian islands, on the fortress island of Oahu, near Honolulu and Pearl Harbor, the navy's great base in the Pacific Ocean. The United States fleet in war maneuvers recently demonstrated that the army air defense in that locality was not adequate fully to shield the naval station from aircraft bombs.

This information of new air bases may well focus public attention upon the true inwardness of security in general and the important elements of security in the Pacific area in particular.

The United States owns an extensive coast line bordering on the Pacific Ocean. Beginning at the Mexican border, this coast line extends almost without a break in an arc of a circle northward and westward, through South-east Alaska, the Alaskan peninsula and the Alaskan islands, to within 700 miles of the continent of Asia. The Hawaiian islands geographically lie almost at the mathematical center of this arc at an approximate distance from all points on the arc of from 2,000 to 2,300 miles; thus Hawaii has a most important strategical significance in the defensive attitude of the United States in the Pacific Ocean.

In addition to the defense of this vast coast line, the United States is responsible for the physical security of the Panama canal, Guam, and the Philippine islands, the latter still under American sovereignty. This great archipelago is, figuratively speaking, tucked away in the Western Pacific and screened by the numerous Japanese mandated islands, the Marianas, the Marshalls, and the Carolines.

Defensive security of positions in the whole of the Pacific area may well be said to be dependent upon the existence of a power which can be measured in terms of both fleet strength and fleet mobility, two complementary factors. Fleet strength deals with power; types of warships and numbers of surface, subsurface, and aircraft available for war use. Fleet mobility hinges upon facilities for repairs and upkeep of ships and the supply of stores and fuel.

Safe Anchorages

This second factor is, in turn, dependent upon safe anchorages, gun-protected, and rendered secure by all the means and weapons known to a modern army, in order that the fleet may be able to accomplish its refit and fueling unmolested from attack by the enemy's sea and land power.

Security in the Pacific from San Diego to the island of Attu, the most western in the Alaskan island chain, and also security in Guam, the Philippine archipelago, and Panama demands the full mobility of the entire available war fleet of the United States within that vast area of ocean.

The Hawaiian base constitutes a sturdy sentinel in the Pacific,

potentially guarding every point on the arc of our coast line. The naval base at Pearl Harbor, if adequately defended and fully equipped, will give within a definite area full mobility to the war fleet based thereon. From this secure base, the fleet can reach any point threatened on the vast arc of the coast line.

This is the length and breadth of our security in the Pacific. The route between Hawaii and the Philippine archipelago, when taken by our fleet, is flanked by the Japanese mandated islands available for bases from which to sever the lines of communication of the fleet. The potential submarine and air bases in these flanking islands are astride the vital lines of communication of the United States to its possessions in the Western Pacific.

The security of our defenses may be said to reside in three factors:

- (1) Fortifications, including mobile army and aircraft.
- (2) Naval bases for refit and supply.
- (3) The war fleet of all types, including submarines and aircraft.

Fortifications and a mobile army of all arms give initial security to a position, warding off all attacks by an enemy force, both military and naval. With the complete security of the naval base and anchorage safeguards, the war fleet will be enabled to leave its base at will and return to it, when requiring the base's resources.

The naval base well guarded will give all manner of sustenance to the ships of the fleet and provide them with power, energy, and morale to keep their mobility undiminished.

The war fleet is the active principal of our sea defenses. For its benefit, the other elements owe their creation.

The complete security of Hawaii gives security to our continental Pacific coast. The mobility of the fleet

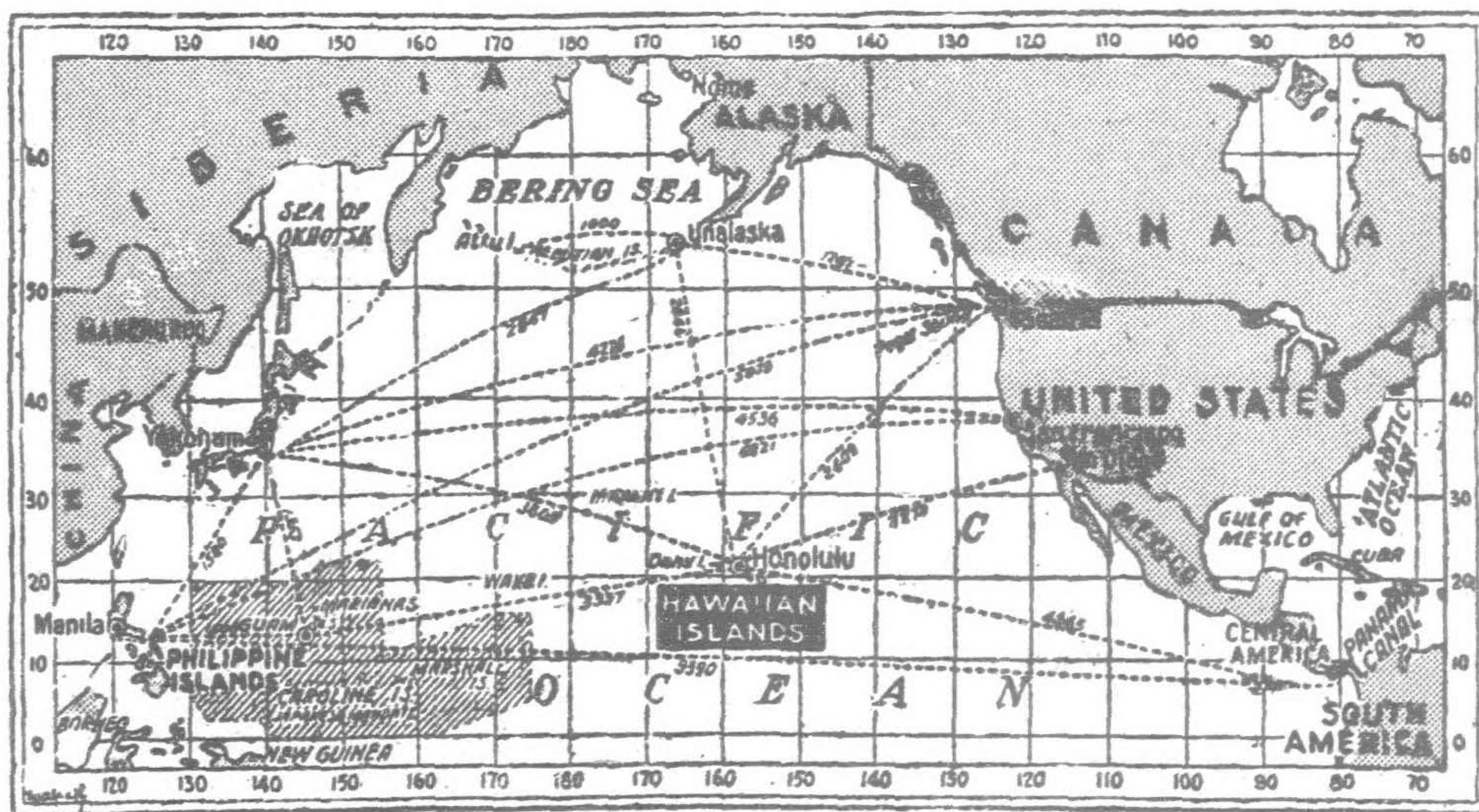
based upon Hawaii will constitute vastly more than a mere discouragement to any enemy's sea forces desiring to attack in that eastern area of the Pacific along our continental coastline.

Fixed Defenses

In the absence of the fleet from its bases, fixed defenses are yet imperative. These are by modern custom reinforced by mobile heavy railroad artillery, a mobile army and an effective air force. To these elements of defense the navy contributes submarines, fast mine layers, mine sweepers, and long-range scouting aircraft. This supplementing of the army defenses with naval defensive elements is to carry the defensive as far out to sea as possible. The army retains paramount interest in the defense of fortified positions in the absence of the war fleet, and the naval weapons supplied act under the direction of the army commanders.

The harbors of Panama, Puget Sound, San Francisco, San Diego, and the fortress island of Oahu, in which are fleet naval bases and anchorages, have fixed defenses manned by the army. Their defense is the army's responsibility. The war fleet, while in the area embracing Puget Sound, Hawaii, San Diego, and Panama, gives added security to all the above bases and in turn they give the fleet full mobility in that area.

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Hawaii's Strategic Position in the Pacific

The Sino-Japanese Situation

By a Diplomatic Correspondent in "The Osaka Mainichi"

THE world ought to know by this time that anything is liable to happen in China. This remark is by no means made with an unfriendly intention toward the Nanking government. If the Chinese leaders are famous for their suave diplomatic tactics of checking, balancing, and warding off one power by means of another, it is because such policy of ever juggling with the newly developing situation is profitable. If anybody is to be blamed for the atmosphere of uncertainty created by this multi-faced front presented to the powers, the responsibility seems to lie with the powers themselves more than with China.

Even a superficial review of the world politics centering around China within the last four decades will readily show that China within this period of less than a half century was never a stable, well organized state, respected by others. Yet despite her apparent internal weakness, China has always been successful in diplomatic bargaining.

Case of Other Nations

In the case of other nations, including Japan, the position enjoyed in the field of diplomacy corresponds more or less to the national strength and prestige enjoyed. Not so with China. The fact that the Nanking government manages to enjoy "social standing" in the society of nations far above the status merited by its political and financial standing must be explained by factors foreign and outside of China herself.

If the world is surprised to find itself suddenly facing a possibility of Sino-Nippon rapprochement, the world must be equally at loss to know why Great Britain, the United States, and other powers are becoming so alarmed over this possibility. The outburst of diplomatic activities in London and Washington, with their journalistic accompaniment in crescendo, is liable to create the impression that the revival of Sino-Nippon friendship was the last thing expected in the two capitals.

East Asia certainly has been a busy stage for diplomats since 1931. Not satisfied with utilizing the old standby, the Open Door doctrine, that post-World War creation the Nine-Power pact was mobilized to work overtime by the Western diplomats. Still failing to bring about results, the Stimson doctrine was newly launched. Another vessel, the League, was almost wrecked in the attempt to bring the Far East back to *status quo ante* 1931. And all these laborious tasks were for the sake of peace.

Why Are Powers Alarmed?

This brief review of events since the outbreak of the Mukden incident brings the world once more to the question: Why are the powers so alarmed to see China offering to shake hands with Japan? Are the Western nations really not desirous of seeing China and Japan again on speaking terms? Are the powers afraid the shortest route to Sino-Nippon friendship—that of direct negotiations unaccompanied by outsiders' meddling—is liable to mean the end of their voice in Far Eastern affairs?

The latest turn of events in East Asian politics shows more than ever that the peace of the Orient is only secondary to the Western Powers. What they are primarily concerned with is the *status quo* protection of their established interests. It is quite evident that a dual accord between China and Japan exclusive of Occidental influence is viewed as "a most dangerous development" for the tranquility of East Asia.

Since China succeeded in nullifying Japan's claim for a special position in the Far East with the aid of America in 1920, the Nanking government for years endangered peace by following a policy of antagonism against Japan.

Yet, until 1931 when Japan finally arose in self-defense, no State Secretary in America and no Foreign Secretary in Britain saw any need of adjusting the entangled situation. Suddenly in

1931, the whole diplomatic machinery built around the League covenant and the Nine-Power pact was called upon to make "Japan see her folly."

Powers' Efforts Unsuccessful

As far as the Powers' efforts are concerned, they cannot be viewed as successful, but one bright aspect in the recent Far Eastern situation from the Occidental standpoint was that as long as China remained on their side, there was less danger of the much-feared East Asian bloc being realized with Japan acting as the leader. The gradual subsiding of diplomatic activities in the last year or two may be explained in this light.

If the Powers are really desirous of financially assisting China, there was no better time for it than within the last year or two. Psychologically, China as a nation, had her back turned toward Japan and was looking for help from the West. Then why should Britain and America have waited until now to come forward with the proposal of a new consortium? There are only two justifiable explanations: The Powers either must be trying to compete with Japan in courting China's favor or they must desire that Japan become a watch-dog for their new loan. If the latter is the case, it will mean courting Japan to induce her to compromise with her stand of "Hands Off Asia."

None of Their Business

In a recent press interview with foreign correspondents, the spokesman of the Foreign Office made it clear that the question of Sino-Nippon rapprochement is one concerning only those two countries. This means that Kasumigaseki will consider the reported consortium plan entirely independent of the pending negotiations with China, even if the Tokyo government is formally approached by Britain and America regarding the proposal.

Then again, it is obvious that the consortium plan requires two contracting parties, China on one side and the Powers jointly on the other. In other words, China must be made to agree to terms satisfactory to the Powers. This brings the plan up against the old stumbling block.

It is quite evident that the political chaos in China does not warrant any new loan unless the terms are so drastic as to equal or approach the internationalization of China. This has already been proven by the fact that the Powers were unable to utilize the opportunity offered in the last year or two to entrench themselves deeper in China at the expense of Japan. To offer aid now despite the refusal yesterday is obviously too much of a political maneuver to be considered seriously in the field of finance and economics.

As has been mentioned already, anything may happen in China, but even the Chinese leaders are not likely to turn again toward the Powers after making a right about face toward Japan only yesterday. Since 1931, Chiang Kai-shek and his associates no doubt tried all the international channels, seeking assistance in their anti-Nippon policy. That China is finally offering to forget the past and become a true neighbor to Japan is ample proof that she has given up her hope of Occidental assistance. The American silver policy was the last thing China expected to come from a country which enunciated the Stimson doctrine. The present U.S. monetary policy may be a domestic affair of America, but it evidently opened the Chinese leaders' eyes.

Finally, as far as Japan is concerned, it is about time the world understood her policy with regard to her neighboring territory as inevitable. No doubt Tokyo is too busy to accept the rôle of a watch-dog for investors on the other side of the globe. And again, international co-operation is desirable, but it is difficult to forget that America and the League legalized China's anti-Nippon boycott only two years ago.

George Bronson Rea Explains

Certain sidelights of interest on the incident of 1931 that precipitated the Manchurian question are disclosed in a letter published in the "New York Herald Tribune" of February 24 written by George Bronson Rea, who has been residing in Washington, D.C. and acting in the capacity of Counsellor to the Ministry of Foreign Affairs of Manchuokuo. The text of this letter is as follows:

To the New York Herald Tribune:

In your editorial of February 11, entitled "Again Mr. Saito Explains," you ask why Japan did not consult with the treaty powers before "launching a campaign of conquest and alienating Manchuria from China in violation of the nine-power treaty." The 1931 mid-summer files of the Japanese newspapers will disclose that the Cabinet was preparing to lay its case before the world when the explosion of September 18 and the events of the next three days so changed the picture that any explanation it might have made would not have been believed.

After ten years of conciliatory diplomacy the Japanese Liberals realized too late that revolutionary China had embarked on a determined program to destroy their trade by boycotts, ruin their investments and drive them out of Manchuria. Before taking steps to protect their menaced interests, the Cabinet in July, 1931, appointed Lieutenant-General Ugaki as Governor General of Korea and Count Uchida as president of the South Manchuria Railway, with instructions to make a complete survey of conditions and return to Tokyo to attend a general conference of the Cabinet and Privy Council scheduled to take place the second week in October. At this conference, a definite program was to be decided upon and Japan's case presented in a final clear-cut declaration.

The issue was precipitated before this conference could be held. Japan welcomed an impartial investigation into the facts. Despite the full and frank testimony of her highest army officers as to the events of the night of September 18, 1931, the League Commission of Inquiry concluded that "the military operations of the Japanese troops during this night cannot be regarded as measures of legitimate self-defense. In saying this, the commission does not exclude the hypothesis that the officers on the spot may have thought they were acting in self-defense."

No consideration has been given to the hypothesis that China might have prearranged the incident to form a showdown over Manchuria. The Chinese had resorted to such tactics on previous occasions. They deliberately precipitated the issue of the Open Door in 1916 hoping to embroil the United States with the four allies, Great Britain, France, Russia and Japan, over the Siems-Carey canal and railway contracts. They transformed the Paris and Washington conferences into dog-fights with Japan over Shantung and Manchuria. They refused to sign the Versailles treaty and dispatched an emissary to Washington to "break the treaty in the Senate." Failing at the Washington conference to prevail upon the Powers to eject Japan from Manchuria, the Chinese delegation "reserved their right to seek a solution on all future appropriate occasions, concerning those portions of the treaties and notes of 1915 which did not appear to have been expressly relinquished by the Japanese government." This declaration is as valid and binding as the similar reservations of the United States Senate and the British government in accepting the peace pact. To advance the argument that Japan is bound by Article VII of the treaty to communicate fully and frankly with the other contracting parties while China is permitted to raise the issue at her convenience, is discriminatory, holding Japan fast in a trap until China is prepared to settle accounts with her. The reservation must concede to Japan the similar right to enforce respect for her viewpoint whenever, in her opinion, the issue can no longer be safely postponed.

Why should Japan consult with the other treaty powers before taking action in self-defense? In 1927, at the height of the Nationalist-Communist outrages in China, the British and French governments, invoking Article VII of the nine-power Treaty, requested the American government to co-operate in joint armed intervention for the protection of foreign lives and properties in the Yangtze Valley. The American government declined to take

part in this proposed show of force. This precedent would indicate that the United States would never have sanctioned action by Japan alone.

Russia did not sign the nine-power treaty. With the cancellation of the Anglo-Japanese alliance, the only effective check ever devised to keep Russia in her place, she was conceded a charter of license to do as she pleased in Asia. It became a very delicate question as to how far Japan was committed under the terms of the treaty to consult with the other powers and receive their permission to defend herself against a non-signatory state whose proclaimed program was the domination of all Asia.

It is conveniently overlooked that there were thirteen resolutions approved and adopted by the Washington conference which form part of and interpret the main treaties. Resolution 10 provides that China shall reduce her armies, at that time estimated at nearly a million men. Has this pledge been kept? The Chinese armies to-day number nearly 3,000,000 men, with another million armed Communists and a million bandits and irregulars roaming the countryside, preying on the people.

In 1921 Soviet Russia was down and out. In ten short years she became the most formidable power in Europe with an army of over 1,000,000 men. Mongolia has a Red Army of 75,000 led by Soviet officers. Central China is a congeries of Communist republics. While Japan was reducing her land forces to 230,000, she has witnessed the growth of armies on the mainland of Asia to where they now outnumber her twenty to one.

No self-respecting nation will commit suicide to please another nation. Furthermore, a treaty which in practice works out as an alliance between seven powers to hold Japan fast in a trap while Soviet Russia and Nationalist China are permitted all the time necessary to prepare for her undoing, violates the underlying principles of international law and voids itself. The right of self-preservation overrides the treaties.

Pursuant to its declared policy, the Chinese Government on the expiration in 1923 of the original twenty-five year lease to Liaotung, called upon Japan to evacuate the territory. In 1929 it protested against an American loan to the South Manchuria Railway. In 1930, during the negotiations for a new treaty of commerce and amity to supersede that which had expired, it informed the Japanese Minister that no treaty could be arranged until Japan cancelled the 1915 treaty, evacuated Liaotung, withdrew her railway guards from Manchuria and handed over the vast Japanese investments in that territory to Chinese jurisdiction.

It has never occurred to any one that the explosion of the night of September 18, 1931, might have been a put-up job on the part of the Chinese to throw the Manchurian issue into the League. When we are asked to believe that Japan secretly prepared and executed a plan that made her a violator of treaties, it is well to recall that its government had sent its two most capable administrators to Korea and Manchuria to gather the information for presentation to a conference that was to decide its future policy. Is it reasonable to conclude that even if Japan had prearranged the incident she would have selected the very day of the opening of the League session?

Who had the most to gain by precipitating the issue at this time? It was no secret that the Japanese government was preparing its case for presentation to the world early in October. It has since been frankly admitted that had Japan done so she would have been upheld. The Chinese diplomats were accurately informed as to what was transpiring. Is it a coincidence that for the first time in ten years China had been elected to a seat on the League Council and that the explosion of the night of Friday, September 18, synchronized with the opening session of that Council? In the ordinary course of procedure the attention of the Council would have been called to the incident in Manchuria and the machinery started to have the case brought before the League on Saturday morning. Protected by the League Covenant, the nine-power treaty and the peace pacts, and interpreting Baron Shidehara's policy of conciliation as a sign of weakness, the Chinese believed that Japan would not fight. They forgot the Japanese
(Continued on page 129).

New Trends in the Chinese Press*

By J. C. SUN

PAPERS published in the treaty ports and metropolitan cities of China used to have a large circulation in the interior, but the radio has now changed all this. With a small receiving set, every small-town paper can get national and foreign news for practically nothing, for the Central News Agency, the official organ of the Central Kuomintang, makes two news broadcasts daily from Nanking. This has deprived the treaty port and metropolitan press of its greatest asset in competing with the provincial and rural press.

The development of the provincial papers in recent years has been remarkable. So far as national news is concerned, they are quite readable, which means that they have improved in quality. In numbers, the increase is remarkable. According to the Chinese Post Office directory of daily newspapers for the year 1924-25, published in the China Year Book for 1925, Kiangsu had 57 dailies, of which 17 were published in Shanghai; Chekiang had 10; Chihli (now known as Hopei) 17, all published in Tientsin. Peiping, then known as Peking, the capital, led the country with 85 dailies. Hupeh had 36, including 30 papers in Hankow; Hunan 14; Fukien 13; Kwangtung 20; Kwangsi 10; Shantung, including Tsingtao 24; Shensi and Kweichow 2 each; Szechuen 15; Shansi 11; Honan 5; Kiangsi 7; Kansu 1; Anhwei 4; Fengtien 5 and Kirin and Heilungkiang 10. Chahar, Suiyuan, Yunnan, and Chinghai had not a single daily paper.

The list of daily papers compiled by the Publicity Department of the Central Kuomintang early in 1934 shows the following figures: Kiangsu 151, not including 32 in Nanking and 44 in Shanghai; Chekiang 77; Hopei 21, not including 77 in Peiping and 42 in Tientsin; Kwangtung 46; Shantung 27, not including 16 in Tsingtao; Hupeh 39, of which 31 are published at Hankow; Anhwei 36; Kiangsi 25; Hunan 28; Szechuen 16; Honan 26; Shensi 6; Shansi 8; Kansu 5; Ninghsia and Chinghai 2 each; Suiyuan 7; Chahar 5; Kweichow 2; Kwangsi 9; Fukien 17; and Yunnan 8.

Practically all of the provincial papers are subsidized sheets run either in the interest of the local Kuomintang or of those in power. The editors are usually Party men or students with a literary bent who have been compelled to turn to journalism as a last resort after failing to get profitable employment upon graduation. Indeed, the provincial press reflects conditions which obtained in Peiping about a decade ago.

The development of the provincial press is said (although no published figures are available) to have brought down the circulations of such papers as the *Shun Pao* and *Sin Wan Pao* of Shanghai from a daily total of 150,000 each to something like 100,000 for the *Sin Wan Pao* and 60,000 for the *Shun Pao*. These two papers used to have a fairly large circulation in Peiping and Tientsin when Peiping (then Peking) was still the capital of China, and when the Shanghai Chinese press was more free in the publication of news and views not palatable to the Government than it is now, when the capital is close to Shanghai. This change of circumstances has made the Tientsin and Peiping press the best in the country, in the opinion of many competent observers, including Dr. Hu Shih.

The circulation of the metropolitan press has also been affected by the growth and development of the *Hsiao-pao* or "little papers," in recent years, in the treaty ports and cities like Peiping and Nanking. Some of these are scurrilous sheets, but there are others which are quite newsy and respectable. In addition to the news of the day in *bulletin* form, they are very strong in local news and contain many interesting features, including a daily serial of fiction. Time was when the *Hsiao-pao* made no attempt to compete with their big contemporaries in spot national news. For example, for many years the *Chun Chiang Pao*, the outstanding *Hsiao-pao* in Peiping, carried no spot national news of the day; what sold the paper was local news of crime, scandal and the Chinese theatrical world, coupled with a long story in serial form. At one time, its daily circulation exceeded 10,000, a record for Peiping papers then.

Another Chinese newspaperman, who had been in charge of a news agency, then entered the field by starting a little paper, known as *Shih Pao* or *Truth*. It became an immediate success and soon

surpassed the *Chun Chiang Pao*, having to-day a circulation of more than 30,000. The *Shih Pao* not only has all the selling features of its rival but also covers national news in *bulletin* form. Hence its readers are not confined to shopkeepers and ricscha coolies but include educated people and businessmen. Since then several similar papers have been started, and are able to pay their way.

The average size of the *Hsiao-pao* is 16 inches by 10 inches. The type is much smaller than that of the big papers so that more can be compressed within the limits of four pages. The front page is devoted to national news and the back page to local news and theatrical advertising, while features and other advertisements appear on the two inside pages. The monthly subscription is 20 cents, or less than seven cents gold at the present rate of exchange.

There is another class of *Hsiao-pao*, to which the slang term of "mosquito" papers is applied. They flourish in Shanghai, where there is a large class of idle rich who turn with relief from the staid 12-or 16-page dailies, crowded with political and international news, to the sprightly *Hsiao-pao*, filled with political and social gossip. The great majority of these papers appear twice or three times a week, but some are dailies. They do not carry spot news but often give interesting accounts of what happens behind the scenes in the Government. News which the big papers are forbidden to publish by the censor, frequently finds its way to their columns in a garbled form. The editors do not hesitate to color and even manufacture news, and many Shanghai residents can recall how these papers published graphic accounts of some imaginary victories won by the Chinese against the Japanese during the Sino-Japanese hostilities there in 1932; stories which many an unwary foreign correspondent took as true and cabled abroad.

Judging from the popularity of these papers it would seem that they are as successful commercially as the *Hsiao-pao* of Peiping. Their production requires very little capital, for the publisher usually combines the functions of editor, reporter and business manager, while the printing is done on a contract basis. So long as the big papers are not allowed by the censor to turn the searchlight of publicity upon dark and hidden places in higher circles, the public will continue to turn to these small sheets for what it believes to be correct information.

It may sound paradoxical but is nevertheless true that despite a censorship which has made editorial independence almost impossible, there has been an increasing emphasis on editorial writing in recent years. Even between the establishment of the National Government at Nanking in 1928 and the Mukden incident on the night of September 18, 1931, when criticism of the ruling Party and the Government was liable to be interpreted as counter-revolutionary, some papers in Peiping and Tientsin published leading articles every day. If they dealt with national affairs, these articles were usually masterpieces of ambiguity, for a definite stand might have meant suppression.

On the other hand, they commented quite freely on international affairs; as a matter of fact there appeared to be a tacit agreement among editors to avoid commenting on domestic politics when a civil war was threatening between rival leaders of the Kuomintang, and turn their attention to foreign affairs. A marked change in this respect came after the Mukden incident of September 18, 1931. Never had the press been more outspoken in criticism of the Kuomintang and the Government than during the first few months after that incident. Rightly or wrongly the public believed that the Party and the Government were responsible for this unprecedented national humiliation, and the press was quick to reflect this sentiment.

The influence of the press on national affairs, and the extent to which editorial opinion reflects public opinion, is not easy to estimate. In domestic politics, papers with no Party or Government affiliation can be trusted to interpret public opinion correctly, though whether they influence the Government is another question; but on foreign issues they are not always a reliable indicator of public opinion. Indeed, whatever influence the Chinese papers have

*Pacific Affairs.

exercised over foreign relations has been mainly negative and sometimes destructive. For example, after the Japanese occupation of Manchuria in 1931 all the papers with one or two notable exceptions joined in the demand that the Government declare war on Japan. In the light of subsequent events it must be considered extremely fortunate that the Government did not act on this demand; it cannot be denied that the vehement opposition of the press did succeed in preventing the Government from opening direct negotiations with Japan on the basis of the five principles offered by Baron Shidehara. There is now a general feeling among Chinese editors that if negotiations had been started between China and Japan on these principles, Manchuria to-day would still be Chinese territory. For the present state of affairs in Manchuria the press cannot escape a certain measure of responsibility.

On the other hand, the press has made its influence increasingly felt in national affairs. The rapid collapse of the Fukien rebellion in 1933 was due as much to the opposition of the press as to the superiority of the Government army; for if there is anything on which the papers of various shades of political opinion are agreed, it is that China cannot afford another civil war, and this sentiment was made unmistakably clear during the Fukien rebellion.

The make-up of Chinese papers is still influenced by British usage, although many papers have adopted the American way of presenting the news. There has been a growing tendency on the part of some of the leading papers to recruit editorial writers from among college professors and returned students, and one paper in Tientsin pays as much as \$500 a month for the services of one editorial writer. Chinese editorials are more often than not long and ponderous essays. When they deal with international affairs, they are mostly of an interpretative nature. Crusading editorials on domestic affairs are conspicuous by their absence, and a writer in the *Kuo Wen Weekly* has pointed out that Chinese papers are too much preoccupied with national and international affairs to take an interest in municipal problems.

As yet there is no national paper corresponding to the *New York Times* in the United States or the *Times* in England. The nearest approach to such a paper is the *Ta Kung Pao* in Tientsin. This paper, started by a progressive Manchu Catholic shortly after the close of the Boxer Rebellion, had changed hands several times before it was acquired and reorganized by the present management in 1926. By enterprise and editorial courage it succeeded by 1930 in becoming the leading paper in North China. Since 1931 it has acquired new prestige and influence, until to-day it is conceded to be the best and probably the most influential paper in China. Mr. Hu Lin, business manager and moving spirit of the *Ta Kung Pao*, thus sets forth the ideals of his paper:

The publishers of Chinese papers during the pre-revolutionary period (that is before 1911) were mostly literary men with revolutionary ideals and enthusiasm. What they were interested in was the cause of the revolution; they considered it beneath their dignity to try to make their papers pay their way. The result was that few revolutionary papers of that period still survive. The swing of the pendulum came after the establishment of the Republic, when businessmen became interested in newspaper publishing. Some papers in Shanghai began to make money and this brought with it a new conception of journalism, as a business enterprise. I do not deny that journalism has a business side, for if a newspaper wants to be financially independent it must develop its advertising and circulation; and financial independence is a prerequisite to editorial independence and integrity.

But if the business side is overemphasized, journalism will degenerate into a handmaid of predatory business and fail in its higher mission of public service. We wanted to make the *Ta Kung Pao* pay its way and bring some profit, and we have succeeded in some measure, but we have no wish to run the paper as a purely commercial proposition and sacrifice our larger object of service. We feel that those who engage in newspaper work should have something higher and nobler than the mere object of making money, because if one is only interested in making money one should stay out of newspaper work. We strive to make the *Ta Kung Pao* a national paper devoted to the best interest of China.

Political news still predominates in the Chinese press. This has been a subject of frequent comment by foreign observers, but if the Chinese seem to be preoccupied with politics, it is because China is passing through a period of transition when politics is naturally a subject of general interest. There is, however, some point in the

criticism that much of the political news is trivial. The Nanking correspondents of certain papers in Peiping even report the week-end trips of Cabinet ministers to Shanghai. A reaction against this form of personal publicity is already apparent, however, as some of the more progressive papers have come to realize that the general public is not interested in such news.

Considering the numerous difficulties which Chinese correspondents have to contend with—which do not exist in Great Britain and the United States—the degree of accuracy and speed attained in the reporting of political news is remarkable. Chinese political news in the foreign press is usually 24 hours behind the Chinese papers. But the foreign press, with extraterritorial protection, has one advantage over its Chinese contemporaries in that it can interpret Chinese political news with more freedom, though not always correctly. Owing to censorship, Chinese correspondents make no attempt to interpret political developments; and the effect of this is to make the papers difficult for the average man to read, unless one follows the development of the political situation from day to day.

Cable news appears in the Chinese press mostly in *bulletin* form. Many editors take the view that if a telegram is elaborated in the editorial office there is no telling where the practice will end, so that the public may eventually get the impression that all the telegraph news is manufactured in the office. One Chinese paper in Peiping, however, has introduced the practice of editing and expanding telegrams, and although there is still some opposition on the part of conservative papers, the indications are that all the papers interested in attracting a larger clientele will eventually follow suit. For, as things stand now, the Chinese paper is published for the educated few rather than for the man in the street.

Next to Chinese political news, foreign affairs frequently receive much fuller treatment than they deserve on their own merits. It is true that the educated Chinese is always interested in international events, and that this interest has been increased since the Mukden incident of September 18, 1931; but some of the space devoted to foreign news is due to the fact that China is the happy hunting ground of foreign propagandists. Because it has one-fourth of the human race, and is potentially a great country, the whole world seems to be competing for the good-will of China. The result is that the papers are supplied with foreign news practically free of charge. Through the Central News Agency, which handles the distribution of the *Reuter* (British) and *Havas* (French) news services, a Chinese paper published in Peiping, Hankow, Nanking or Tientsin can get at least seven columns of foreign news for less than \$60 a month, or \$20 gold. Japanese and German news is supplied by *Rengo* and *Transocean*, gratis.

Growing interest in sports in recent years is evidenced by the fact that the principal papers in Shanghai, Nanking, Tientsin, Hankow and Peiping set aside at least half a page for sports news, and during the winter soccer season or when a sectional or national athletic meet is in progress, several pages may be printed. During the Far Eastern Olympics at Manila in May, 1934, Chinese papers throughout the country published much fuller daily accounts than the foreign press. The sports writers are frequently ex-college athletes, and they command quite good salaries as compared with other editors. Like Western sports writers, they have evolved a vocabulary of their own, which includes many apt translations of American and British sports terms.

There is one type of story in which the Chinese press is still very weak, namely news of disasters, railway accidents, shipwrecks, piracies, storms and earthquakes. Several shipwrecks occurred in Chinese waters in 1934 involving in each case the loss of more than 100 lives, but they received scanty treatment from the Chinese papers, though the foreign press played them up. This is either due to the fact that there are so many people in China who live on the border of starvation, that the loss of hundreds of people through flood, famine or sudden calamity does not constitute news, or to the inability of Chinese editors to appreciate the news value of such incidents.

There is a section of foreigners in China who frequently complain that the Chinese press is not reliable in its news of Sino-foreign activities or incidents. This complaint is not unfounded, but can be easily explained. In the first place, there is the language difficulty. Few Chinese reporters speak English and fewer still have foreign contacts, so that whenever important news involving foreigners "breaks," they are handicapped in gathering first-hand information. Even the best papers in the West find it difficult to report international incidents dispassionately. In China this difficulty is complicated by the existence of foreign concessions and extraterritorial

rights, and the growth of the nationalist movement in recent years. In spite of all this, it is doubtful whether the Chinese press is more unreliable as regards foreign news than the foreign press in the treaty ports in reporting Chinese news. Indeed, if it is true that some foreigners do not attach much credence to the reports of the Chinese press concerning the foreign community, it is equally true that Chinese newspapermen do not take reports in the foreign papers about Chinese politics and other affairs very seriously.

Recognition of the importance of local news in the success of a paper was first due to the *Hsiao-pao*, but in recent years the *Ta-pao* or full-sized papers have begun to fall in line. Generally speaking, the Shanghai papers are the most thorough in covering local news, the *Shi Pao* or *Eastern Times* leading in this respect. This paper, which used to be the organ of Chinese intellectuals, was acquired by a wealthy real estate man, and now features stories of crime, the eternal triangle, divorce and scandal. It uses scare headlines, and does not hesitate to sensationalize the news, and has been more than once warned by the Publicity Department of the Central Kuomintang to "exercise more care in the reporting of local news lest the mind of China's youth be polluted." The rest of the Shanghai press is quite conservative in the presentation of local news. Indeed, the criticism that the Chinese press is altogether too frank in reporting social news is no longer true to-day.

In the reporting of crime, however, the Chinese press has still much to learn. Very rarely does a Chinese paper give an accused man the benefit of the doubt. When a man is arrested in connection with a murder or robbery, he is invariably described as the culprit, though his guilt remains to be proved. This is due to differences of legal concepts. In England and America, when a man is accused of murder, it is the duty of the State to prove that he is guilty. In China, as in France, though recent legislation has adopted the Anglo-American principle, whenever a murder suspect is arrested he has to prove to the judge and the public that he is innocent.

The financial pages of the more important Chinese papers have acquired increasing importance with growing public interest in domestic loans and foreign securities. They are highly technical, and crowded with daily quotations of Chinese Government bonds, foreign and Chinese company shares, exchange rates and gold bar exchange. Interpretative articles on the trend of market prices and bond quotations by Chinese economists and bankers are occasionally published.

Daily supplements, covering such subjects as education, foreign relations, women's interests, sociology, science, religion and medicine, may be said to be edited primarily for the students, who make up a large part of the clientele of a metropolitan paper. Usually they are entrusted to writers who are considered authorities, the editor-in-chief only exercising a general supervision. Some of the supplements are of a very high academic order, but most of them are supposed to be for the general reader.

No honest Chinese can deny that there is no freedom of the press in China to-day. As a matter of fact, it has never existed. The writer is inclined to believe that it is a principle peculiar to England and the United States and alien even to Continental Europe. Freedom of the press is only possible in countries where the liberal tradition is strong, and where there is a very high level of literacy. In countries where the great majority of the people are illiterate, and where free institutions are either unknown or have been only recently imported, freedom of the press can be easily abused. Educated Chinese, particularly those trained in the Anglo-Saxon tradition, often fret at the restrictions which the Government has imposed on the press; but since, as in every country, the educated suffer for the sins and ignorance of the many their views are not few have to likely to influence the Government.

So far as the Government is concerned, there is a good case for censorship, based on the tenet of the Kuomintang, that the Chinese people are as yet not fit to exercise their political rights, so that a period of political tutelage is necessary before a really democratic government can be possible. Until then, the press must be subject to censorship. Another argument is that China has been confronted with an unprecedented national crisis since the Mukden incident of September 18, 1931, and that so long as this crisis lasts, such popular liberties as freedom of the press and assembly must be curtailed or suspended.

There are few Chinese, not excepting newspapermen themselves, who seriously believe that freedom of the press is possible or desirable at this stage of the nation's political development. The main possibility of improvement is in the intelligent exercise of censorship. The present system is far from intelligent; in many

instances it borders on asininity. An example in point is the suppression of all details relating to the rescue of five Britons captured by Shantung pirates from the British steamer *Shuntien*. The rescue was effected by the British Navy in Chinese waters, but this fact was suppressed by the censor. The official view for this suppression was presumably that it was a reflection on China that the rescue should have been effected by the British Navy; but one would imagine that the people would have had an additional incentive to work for the improvement of their country's status if they had known the circumstances under which the British captives were released.

It is desirable that Chinese pressmen should hold the principle of the freedom of the press as an ideal to be striven for; not as something to be had for the asking. They should fight for it and prove themselves fit to exercise it. In England and the United States there is a strong solidarity among practitioners of the press. Whenever the freedom of the press is involved, newspapermen can forget party or personal differences and speak and act as one man. In China no such solidarity exists. As things stand at present, a free press is a remote possibility, if not a pious hope.

Pending Naval Questions

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it has other uses which make it valuable. The total carrier tonnage is small—135,000 tons—compared to the total tonnages in the battleship and cruiser classes. The Washington Treaty set an upper limit of 27,000 tons for the individual unit. This undoubtedly is too large and could be reduced if there were any point in asking for such a reduction. Not huge size, but speed, habitability, certain sea qualities and adequate protection against air and small surface craft are the first essentials for the air craft carrier.

In the matter of the destroyer type there have been very few disagreements. At best it is a comparatively small ship. If ever the submarine is abolished the number of destroyers could probably be reduced, since one of their major activities would have been removed.

The technical matters which I have indicated here may present difficulties at the coming naval conference. But after all, the main question is political. It must be this: Will the good beginning in the establishment of security and the preservation of peace made at the Washington Conference be allowed to pass into the limbo of forgotten things?

George Bronson Rea Explains

(Continued from page 126)

army. When the Council reconvened on Tuesday the Kwantung army of 17,000 men was in possession of Mukden and the main strategic centers of Manchuria. The veterans of Chang Hsueh-liang were in full retreat toward the Great Wall. Mukden was without a government and the Chinese delegate was hysterically appealing to the League to do something.

If we are seeking for motives, there is sufficient evidence to show that China had everything to gain by precipitating a showdown. Japan had everything to lose. She had only to present her case to the League to command its sympathy and permission to defend herself. It can be shown that there existed many compelling reasons why China, fearing the consequence of Japan's appeal to the League, should provoke an incident to forestall her and turn world sympathy in her favor. If suppositions and circumstantial evidence are to decide the dispute, it is clearly apparent that the Chinese had more to gain than Japan by manufacturing an incident that would throw her case into an international tribunal at that particular moment. Had the League acted as a court this evidence would have carried weight in arriving at a decision. But the League does not function as a court. Japan was condemned before the League commission of inquiry departed from Geneva. The prestige, power and usefulness of the League were at stake. The commission transformed itself into prosecution, jury and judge, tried the case in camera on its own evidence, delivered its verdict and dissolved itself. There was no appeal from the decision, no opportunity for rebuttal. There is no way of reopening the case. History in its day will accuse.

GEORGE BRONSON REA.

Washington, D.C., Feb. 20, 1935.

China's Railway Program

A Survey of Progress and Projected Construction : Encouraging Outlook of Development

Special to the "North-China Herald"

SIR Arthur Salter in his report on the economic condition of China laid great emphasis on the necessity for the development of railways as the most satisfactory way of providing the people of this country with cheap communications. Engineers who some twenty or thirty years ago first took part in railway construction dreamed noble dreams of the possibilities of the enterprise to which they were privileged to give their services. Yet to-day those dreams are still unfulfilled. The total mileage of China's railways, excluding Manchuria, is now only about 6,000 miles. This gives one mile of railway to 70,000 people and 300 square miles of territory and compares unfavorably with India where there is a mile of railway to 8,245 people and 44 square miles, or Soviet Russia, where the figures are 3,362 and 171 square miles, or Australia, 238 and 108 square miles, or New Zealand, 441 and 30 square miles.

The reason for the slowness in developing railway communications may best be described as political. Railways were regarded as a foreign device forced upon a reluctant people. Local provincial enterprises came into existence, but proved unsatisfactory. It is interesting to remember that the Imperial Edict of 1911 ordering the resumption of all trunk lines by the state was a contributory cause of the Revolution of 1911; but the Republic which replaced the Manchu Empire actually had to confirm its predecessor's policy and establish the state control of trunk lines in 1913-14.

Program Hindered

In the early days of the Republic foreign financial assistance was invited for railway construction. The program was hindered by civil war, although good progress was made in unification of accountancy and standardization of construction and equipment. The European War dried up the sources of financial assistance from abroad, and after the War progressive deterioration in the credit of Chinese railways in the money markets of the world,

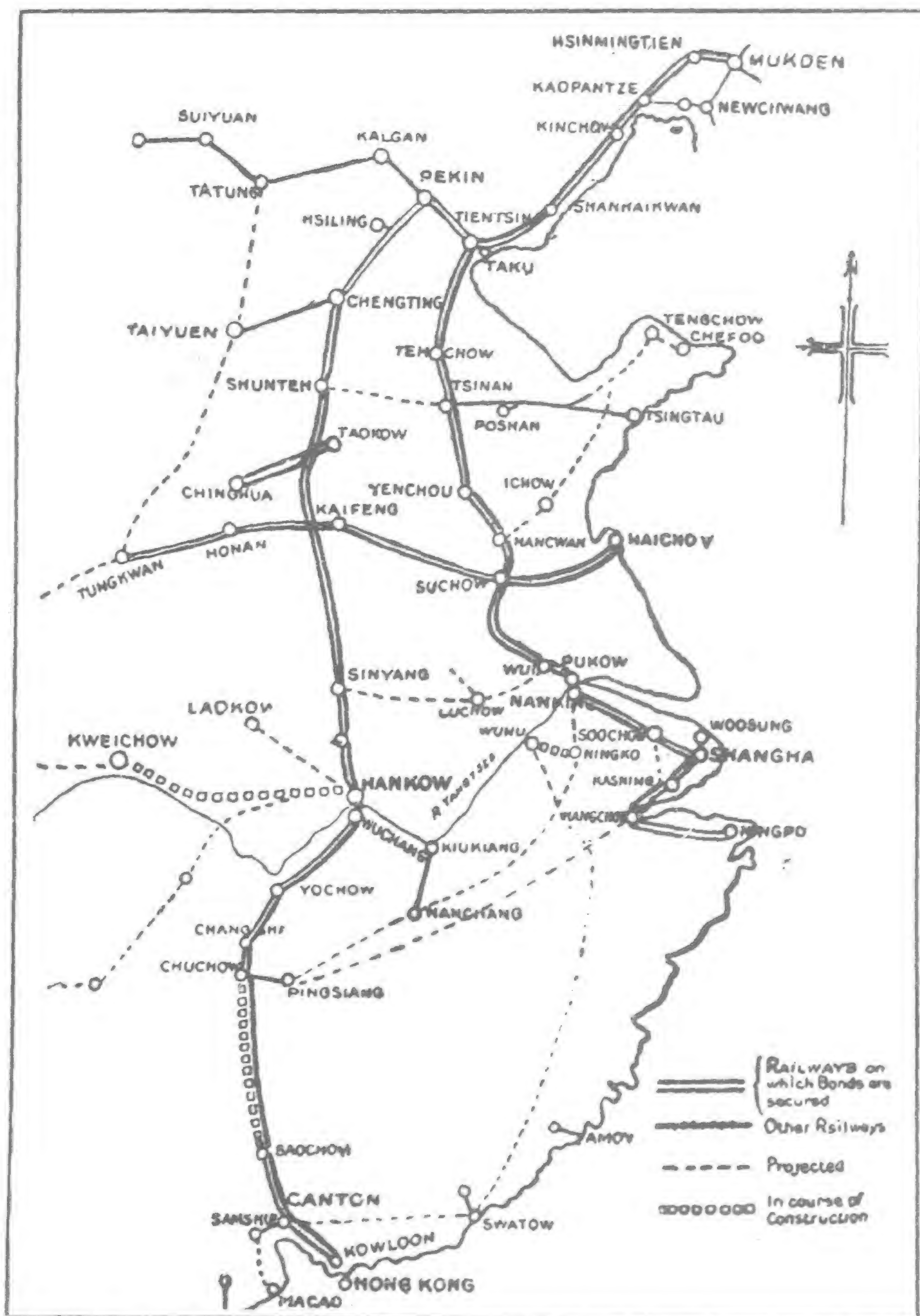
owing to the failure of the Government to meet obligations for the loans of existing lines, precluded foreign financial assistance in extension of construction. The collapse in the financial stability of the railways began in 1924 and 1925 and, curiously enough, the Chinese people and the Government began then to take direct personal interest in the railways and have shown in recent years a strong determination to extend the system. By definite, although rather halting steps towards meeting loan obligations, the Government have to some extent improved the credit of the railways.

Lung-hai Railway

On the Lung-hai Railway active progress has been made on

the extension of the line eastwards to the coast and westwards to Sianfu. The extension beyond Sianfu is only proposed at present to cover about 30 miles. To the west the line has been completed from Tungkwang to Sianfu, a distance of 132 kilometers, and eastwards to the coast at Haichow Bay, where considerable progress has been made in the harbor works, while an extension of the main line from Tapu to Laoyao, 28 kilometers, has been constructed. In addition, a branch line of 31 kilometers has been built from Chao-teng to Taierschuang, joining the branch line of the Tientsin-Pukow Railway to the latter place, from Lincheng.

The North to South Railway, from Tatung, was projected as a standard gauge line of over 700 kilometers in length. It would have joined the Peking-Suiyuan line at Tatung and passed through Taiyuan, the capital of Shansi. However, the Shansi Provincial Government began to build a meter-gauge railway on the same location and this is called the Tatung-Puchow Railway, Puchow being on the Shensi border but within the province of Shansi. Much progress has been made on this meter-gauge line and rails have been laid for 350 kilometers. About 150 kilometers have been



Map showing existing railways in China and plans for the future development of other lines

constructed from Tatung southwards via Taiyoh and Kwohsien to Yuan Ping 117 kilometers north of Taiyuan and about 200 kilometers from Taiyuan southwards via Kih sien, Kiensiu and Howhsien towards Linfeng. A "light railway" standard of construction has been adopted and the line is said to be unballasted.

The Yutse-Taiku Railway was originally intended to be a portion of the Tatung-Tungkwan standard gauge line, 35 kilometers in length. When, however, it was found that the Shansi Provincial Government were constructing the Tatung-Puchow meter-gauge line on a parallel location, the standard gauge construction was suspended, and the Yutse-Taiku section was altered to meter-gauge and will form a portion of the Tatung-Puchow meter-gauge line.

The Huainan Railway, about 150 kilometers from Loho on the Huai River, passing through Hofei and the Tatung and Huainan coalfields to Yuchikou, on the north bank of the Yangtze opposite Wuhu, is reported to be completed. This line will presumably connect at its northern end with the Tientsin-Pukow Railway at Pengpu.

South of the Yangtze

South of the Yangtze, there is the Chen-kung standard-gauge railway from Hangchow to Kiangshan and Yushan, in Kiangsi, 344 kilometers. This enterprise has been completed under the auspices of the Chekiang Provincial Government, and full details were recently published in this journal. The line is being carried on from Yushan to Nanchang, about 300 kilometers in length.

The Nanking Chao-an Railway is being constructed by the Kiangnan Railway Co., which has also taken over the Wuhu-Chapoo Light Railway. The projected line is to run from Nanking through Wuhu, Sunchiapu (Anhwei), Kiangshan (Chekiang) and Yenping (Fukien) to Chao-an, about 1,200 kilometers, and will later be extended from Chao-an to Canton. Some progress has been made on the Wuhu-Nanking Section and 80 kilometers of line has been constructed from Wuhu to Sunchiapu.

Although no construction has been actually started on the completion of the gap in the Shanghai-Hangchow-Ningpo Railway, between the Tsango River, 77½ miles from Ningpo, and the Chien Tang River, at Zahkou, near Hangchow, an agreement for a loan for the completion of the line was executed in November. When the loan has been issued work will be commenced and it is hoped that that event will not be much longer delayed.

Preliminary work has been started on the combined road and rail bridge over the Chien Tang River, which, with the construction of the 78½ kilometers length of line between the river and the present terminus from Ningpo, will provide through railway connection between Shanghai-Hangchow-Shaohsing and Ningpo.

The Chien Tang Bridge is of 16 spans of 220 feet, and the roadway is to be carried on the upper booms of the steel trusses, which carry a single line of railway below, as through spans. The founding of the piers will probably present difficulties owing to the material of the river bed. The steel spans may be erected on shore and floated out on pontoons to position on the completed piers.

Canton-Hankow Line

The most important of China's trunk lines, economically and politically, is, however, the Canton-Hankow Railway, the progress towards completion of which is of special interest at the moment in view of the issue of the Sterling Indemnity Loan. By that loan capital has been made available for the completion of the railway upon the security of the annuities of the British Boxer Indemnity and accumulated instalments. The Ministry of Railways had previously been pushing forward that construction from Shuichow, the terminus of the southern section started from Canton as a provincial undertaking. The section from Shuichow to Lochang, 51 kilometers, was completed in October, 1933, and work then was being pushed forward through the difficult section from Lochang to the Hunan-Kwangtung frontier.

The work of construction on the Hupei-Hunan section of the Canton-Hankow Railway reached Changsha, the capital of Hunan, during the War, and it was impossible to issue a supplementary loan to complete the line. At Changsha the new line connected with the provincially constructed section from Changsha to Chuchow, where a line had already been built from P'inghsiang to Chuchow to transport coal from the P'inghsiang Collieries to the Siang River. The gap thus left between Chuchow and Shuichow,

the terminus of the line from Canton was about 280 miles, or 450 kilometers, and of this nearly 100 kilometers, from Lokow northwards, have been completed and work is now in hand in all the construction divisions. The line is expected to be completed before the end of 1936.

From Chuchow to Ichang, on the Hunan-Kwangtung border, the country is not exceptionally difficult. The location follows approximately the valley of the Hsiang River as far as Hengchow, where the Lei River, a branch of the Hsiang, is crossed, and thence the line runs up the Lei River valley to Chenchow on the upper Lei River. From Chenchow to Ichang the line is located in beautiful "Highland" country, which is fairly easy, but from Ichang southwards across the provincial border, and on to Lochang, the country is quite difficult, as there is no defined watershed or natural "divide" between the provinces but an inchoate jumble of hills of limestone formation. The location reaches the Wushui River, a branch of the North River, not far south of Pingshek, and thence follows the river side to Lochang on the North River.

There are three important bridges on the Chuchow-Lochang Section over the Lu, Mi and Lei Rivers, all branches of the Siang River.

In the difficult country across the Hunan-Kwangtung border, a location has been obtained.

Difficult Construction

On the section of the line which closely follows the North River, between Taishekmen and Lochang, in Kwangtung, a sharp curvature has been adopted so as to follow closely the contour of the river, and, while avoiding much tunnelling, has involved heavy work in retaining walls, rock cuttings and river defence. There are five or six tunnels on this section, the longest of which is only 750 feet.

It is estimated that some 1,180 kilometers of new lines have been constructed during the last two years. It is, however, evident that, although some progress can be recorded, what has been effected is an insignificant portion of the railway program which is requisite for the economic development of this vast Continent.

It does not appear that the internal financial resources of China can be equal to the required aim, and it seems essential that the assistance of foreign finance should be forthcoming if an adequate program of railway construction is to be carried out in a reasonable period of time.

In this country of vast distances the outstanding need for China in her aim for economic development and improvement in standards of living is the facility for transport of agricultural produce throughout the country, and, as China produces coal and not oil, it is surely impossible that low grade agricultural products can bear the cost of motor transport by road, so that, where waterways are lacking, trunk railways are essential for the purpose.

Cheap Power for Canton

In connection with the construction of a gigantic hydro-electric power station in Yung Yuen on the Yung River, near Canton a local German firm is reported to have offered credit to the Provincial Department of Reconstruction for the purchase of all machinery and necessary equipment from Germany.

An electrical engineer of the German firm has arrived to conclude an agreement with the Kwangtung Provincial Government. The amount involved is not disclosed, but it is understood that the project costs over ten million dollars.

The same German firm sent two engineers to Yung Yuen over a year ago, who found that by utilizing the water power of the Yung River electricity can be produced at a very low cost. After the establishment of the hydro-electric plant, Canton will be supplied with current at a very cheap rate.

Electric supply will be needed for the proposed iron and steel plant in Tunglong, just off the harbor limits, the new arsenal at Pa Kiang and the proposed aircraft works at Shaokwan. Yung Yuen is only about 80 miles above Canton.

Other projects of the Kwangtung Provincial Government include the sale of wolfram in the United States and the purchase of vessels from the United States Shipping Board for service between ports in Kwangtung.

Telephone Staff Training in Shanghai*

By W. MILES, A.M.I.E.E., Education Division, Shanghai Telephone Company

THIS paper is intended to cover, in a general way, the activities of the Shanghai Telephone Company from a staff education point of view. These activities, while not assumed to be in any way original, may be of interest to other organizations carrying out or contemplating similar work.

Shanghai is divided administratively into three portions, these being known respectively as the International Settlement, the French Concession, and Greater Shanghai. The former two portions are foreign controlled, and it is for them, together with a certain section which is known as the Extra-Settlement or Outside Roads Area, that telephone service is provided by the Shanghai Telephone Company; Greater Shanghai is served by a separate system operated by the Chinese Government Telephone Administration. The following table will serve to indicate the size and relative importance of the various parts, but it should be noted that the population figures given are only approximate:

		Area Square Miles	Population	
			Chinese	Foreign
Greater Shanghai	..	320	1,753,700	9,300
International Settlement	..	8.75	971,400	36,400
French Concession	..	3.94	478,700	17,700
Total	..	332.69	3,203,800	63,400

Some idea of the rapidity with which Shanghai has developed, particularly within the past thirty years, will be obtained from the fact that in 1900 there existed one magneto telephone exchange with 107 subscribers, while to-day the area served by the Shanghai Telephone Company contains about 45,000 subscribers' stations including 800 private branch exchanges, one common battery exchange and seven full automatic exchanges of the No. 7-A Rotary type, the latter housed in air-conditioned buildings. In addition, facilities are provided for inter-communication with Greater Shanghai and for toll connection, over lines which are under the control of the Chinese Government Telephone Administration, to Hangchow, Nanking, and about sixteen other towns in adjacent provinces. Other branches of the company's activities are the maintenance of a Burglar Alarm Service, a Police Street Telephone System, and a small Teleprinter Service.

Great strides have been made in the development and improvement of the Shanghai Telephone System during the past few years. Prior to 1930 the system was operated largely on a local battery basis; since that time, however, six new buildings have been erected and equipped with automatic apparatus, with the result that 97 per cent of the whole system is now automatic, the remaining three per cent being located in the Extra-Settlement or Outside Roads Area.

*Electrical Communications



Heart of the Business District of the International Settlement, Shanghai, with the Whangpoo River in Background

The vast amount of work involved in the conversion of the system which, incidentally, was carried out in less than twenty months from the time the company became associated with the International Telephone and Telegraph Corporation, need not be enlarged upon.

Coincident with the planning of the conversion and the development of the system, the necessity arose for serious consideration of the question of staff training, and in 1929 an Education Division was formed to take care of this important branch of the company's activities.

The work covered by the Education Division during the past four years includes the training of existing staff in new methods and in the handling of new types of equipment, and also the engaging and training of new staff. The latter function, particularly during the conversion period when a considerable temporary increase in staff was required, has proved no easy task since, from a telephone point of view, Shanghai is somewhat isolated. It is therefore extremely difficult to obtain new personnel who have any previous knowledge of the work, or who have had previous mechanical or electrical training of any kind; in fact, although the standard of general education among the working class Chinese is steadily improving, it is still so low that more than ordinary care has to be exercised in choosing recruits in order to ensure obtaining the right type of man. When engaging new staff, every effort is made to obtain men having at least a fair knowledge of the English language, and each applicant is required to pass an examination which is calculated to test his general knowledge and ability. This procedure, coupled with a series of further tests and close observation during the preliminary training stages, has met with considerable success since it facilitates the early weeding out of unsuitable individuals, and results in a minimum subsequent wastage and a better type of man being obtained than would otherwise be the case.

In addition to the recruiting and training of new staff for the various grades, a scheme was inaugurated in 1929 under which a limited number of foreign and Chinese youths with a particular aptitude for mathematics and technical subjects were selected from the local schools to undergo special training as apprentices; and a further limited number of Chinese youths, who had completed an engineering course at an approved college, were chosen to undergo special training as students. These apprentices and students, after having passed through a preliminary course of three months' training in the school and, while continuing their general and technical education by means of day and evening classes under the tuition of the Education Division staff, were given from three to five years' field training and experience with the various divisions but remained under the control of the Education Division for all ordinary purposes. This scheme also has met with remarkable success, a surprisingly small wastage having occurred. A few of these youths have already been permanently posted to various



Fig. 1.—A Corner of the Reading Room and Library

divisions, some of them in a minor supervisory capacity, and are daily proving their worth to the company and thereby justifying the scheme in a most satisfactory manner.

Other activities of the Education Division, apart from those of the Practical Training School, referred to hereinafter, have included language classes in English and Chinese; special evening class tuition, and assistance in mathematics and physics for members of the staff who were desirous of taking various examinations; the organization and conduct of summer vacation training schemes for Chinese University graduates who are taking communications courses; and the organization and maintenance of a library and reading room. The latter, a portion of which is shown in Fig. 1, in addition to providing a fairly comprehensive technical library, provides facilities which enable the staff to keep in touch with telephone progress and events in other parts of the world through the medium of the many technical journals and house organs which come to hand, and it also houses a fiction library which is the property of the Company Recreation Club.

In passing, it may be mentioned that the permanent staff of the Education Division now comprises one foreigner, two Chinese assistant teachers, and a small clerical staff. The two assistant teachers are youths who joined the company as apprentices four years ago, and who, after having spent some time in the field, were selected for their general ability and knowledge of English to undergo special training and instruction in the art of teaching. In addition to the permanent staff, however, it is the practice, more particularly with regard to outdoor plant training, to bring gang foreman into the school to assist in general supervision and teaching when required.

The most important branch of the divisional activities is the Practical Training School. This alone, during the past three and a half years, has handled 1,220 students in full and part time courses ranging in duration from one week to four months, and no less than 1,100 students in evening classes which are conducted during eight months of each year. The training school is well equipped with all necessary apparatus to enable it to carry out practical training in every branch of plant work. It at present occupies a considerable portion of an indoor floor space of about 3,200 square feet which is allocated to the Education Division in one of the central office buildings, this space being divided into practical training rooms, lecture rooms, library and reading room, and offices. In addition, a space of about 9,000 square feet on the roof of the same building is devoted to an open air school for the training of staff in outdoor plant work. The equipment of the indoor school, portions of which are shown in Figs. 2, 3 and 4, includes a full automatic demonstration model of the rotary type; working installations of the various types of private branch exchanges and all other types of subscribers' apparatus; a wire chief's desk and

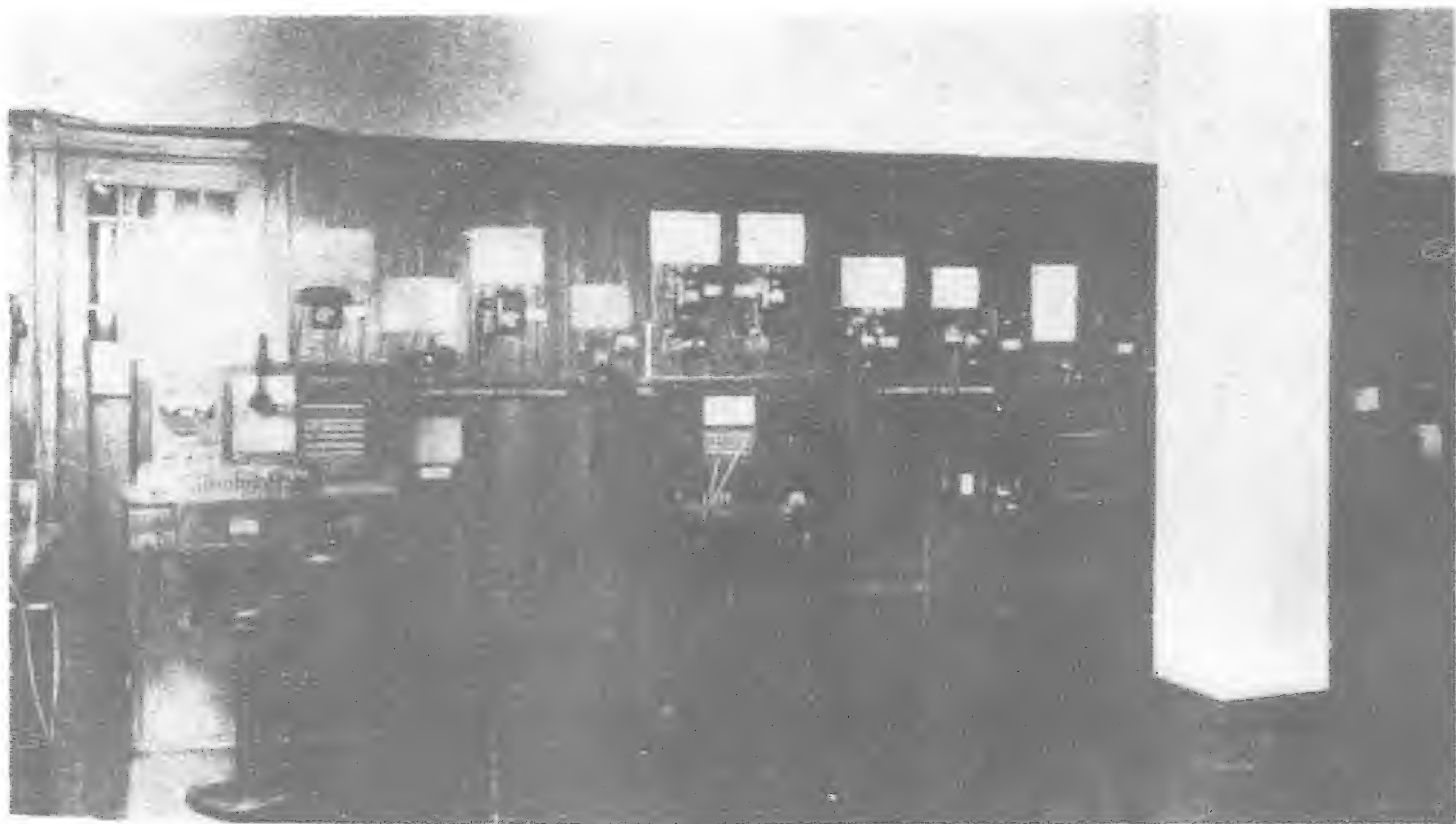


Fig. 2.—A Section of the Indoor School Showing Wire Chief's Desk and P.B.Xs

other testing equipment; a number of special frames which are used for machine adjustment training and which are equipped with all the various types of automatic exchange apparatus; a small main distribution frame adapted for practice work in cabling, wiring, etc.; a model cable distribution scheme; an Epidiascope capable of projecting slides, rough sketches, solids or text book pictures on to a screen; a cinematograph camera and projector; a small telephone museum containing articles of historical and technical interest; and a considerable amount of miscellaneous equipment such as demonstration apparatus and devices, work benches, tools, etc.

While it is, of course, essential that much of the demonstration and practice equipment be of the latest type as used in the field, a considerable economy is effected by using as much recovered or scrap material as possible for practice purposes. This applies to almost all cable and wire, while a great deal of the preliminary training on repairs and adjustments is carried out with the aid of old telephones, relays, switches, jacks, keys, etc., thus avoiding possible damage to good equipment by inexperienced students.

During training, every opportunity is taken to elucidate the various points with the aid of actual equipment or demonstration devices, while the value of the screen for illustrative purposes cannot be exaggerated. At the time of writing, the school has a stock of more than 500 pictures and slides which are used in conjunction with the Epidiascope during the various courses; these include pictures illustrating magnetic and electrical phenomena, a large number of sketches and photographs of all kinds of apparatus showing the construction details and methods of carrying out replacements and adjustments, sectional and complete circuit diagrams, etc. There are available also innumerable pictures which can be projected direct from text books, and a number of solids such as relays, dial and switch mechanisms, etc., which can be placed bodily into the Epidiascope and projected by reflection on to the screen.

The training of staff for the installation and maintenance of outdoor plant is carried out mainly in the roof school to which reference has already been made. This school, a portion of which is shown in Fig. 5, contains among other things, a number of portable shortened poles set in heavy wooden bases; a typical manhole constructed of rough wood; and a number of portable imitation walls containing doors and windows. This equipment facilitates the carrying out of courses covering underground, aerial, and block cable distribution work as nearly as possible under actual field conditions. Courses covering each of these three subjects, or combinations thereof, are conducted as required.



Fig. 3.—A Portion of the Indoor School Showing Demonstration Equipment

Practice in aerial and block cable distribution to pseudo subscribers' premises is carried out on the roof from a 50-pair cable, one end of which terminates on the small main distribution frame in the indoor school; from this frame, the various lines can be cross-connected by jumpers to school exchange equipment and can be connected to the school test desk by means of the usual M.D.F. flexible cords. Thus, actual distribution, installation, and maintenance work, including testing and fault location, can be carried out in its entirety by the students concerned.

A certain amount of training during courses dealing with aerial and block cable work is carried out in the indoor school with the aid of the model cable distribution plant. This model provides a comprehensive view of a typical distribution scheme and includes underground, aerial, block and building cable distribution terminating on subscribers' and exchange equipment. The exchange equipment is represented by the automatic demonstration unit and the test desk; they are connected to a miniature main distribution frame comprising one of each type of M.D.F. testing circuits, one strip of 20 break jacks, a cross-connecting field and one strip of 20 protectors to which a 20-pair cable is connected to represent a main feeder cable. From the feeder cable, branch cables are fed off to block and building cable distribution along the walls, and to aerial distribution over shortened poles which are secured to the floor and to the side benches, the pairs being multiplied and numbered in accordance with standard practice. Full size terminal boxes, insulators, brackets, etc., are used, from which the various pairs are connected to subscribers' equipment arranged around the room. Here the men are brought for lecture and demonstration purposes during each course and, in addition to receiving instruction in their own particular work, they are given an insight into the principles of exchange operation.

The model cable distribution scheme is also found extremely useful for giving students taking other courses a general idea of the principles of cable distribution; it is found to be particularly useful during the training of test clerks, in that the students are given a comprehensive view of a complete system including subscribers' apparatus, all kinds of outdoor plant and exchange equipment. Thus a testing student can observe all the work which is being carried out in conjunction with the various tests, and can therefore obtain a much better knowledge of fault location.

The comparatively small amount of cable jointing training which is at present required, is carried out on the roof in the model manhole and in the tents which are shown in Fig. 5. During the automatic conversion period, however, the tremendous amount of underground cable work which was involved, necessitated the use of many more splicers and plumbers and the formation of



Fig. 4.—A Machine Adjustments Class at Work

a much larger cable jointing school than is normally required. To meet this demand, some empty rooms in one of the new exchange buildings were occupied, and rough benches fitted with cable clamps, scrap trays, and other necessary equipment were installed. About 160 men, comprising recruits and existing staff, passed through this school during a period of six months; three separate courses, dealing with helpers, splicers and plumbers, respectively, being conducted simultaneously. These courses varied in duration from one to twelve weeks according to the requirements of the men concerned. A portion of this school, showing one Japanese, one Chinese, and one Russian student at work, is shown in Fig. 6.

The training of staff to handle subscribers' equipment may be said to come under the two general headings of (a) the installation and maintenance of the simpler kinds of subscribers' apparatus such as single instruments and wiring plans, and (b) the installation and maintenance of private branch exchanges. Such training is usually carried out in two separate courses under the above headings, although sections of these courses have been taken separately when requirements demanded speedy specialized training. The training procedure for both of these courses is similar and consists generally of preliminary tuition in the principles of the construction, the characteristics, circuit operation, and care of the apparatus the men are required to handle; this is followed by practice in cabling and wiring to meet various location conditions, and then by actual installation work on benches and on the walls of one of the school rooms which is panelled with inexpensive wood for this purpose. The cable pairs used during installation practice are taken from the model cable distribution scheme so that, on completion of an installation, the students concerned can observe and take part in the completion of the associated work on the outdoor plant and in the exchange, the latter being represented by the miniature main distribution frame, the test desk, and the automatic demonstration unit. Until recently, P.B.X. circuits and wiring were taught with the aid of large table panels on which each separate circuit was wired in skeleton, but it was found that they took up too much valuable floor space and they were discarded in favor of vertical cross-section models of the two most important types. These models show all the equipment and wiring in a very clear and simple manner and are being found very useful, although not quite so convenient as the table panels.

Training in the maintenance of subscribers' apparatus is carried out on various types of private branch exchanges and on all other kinds of subscribers' apparatus which are permanently installed in the school. The private branch exchanges are connected by trunk lines to one of the main exchanges, by tie lines to each

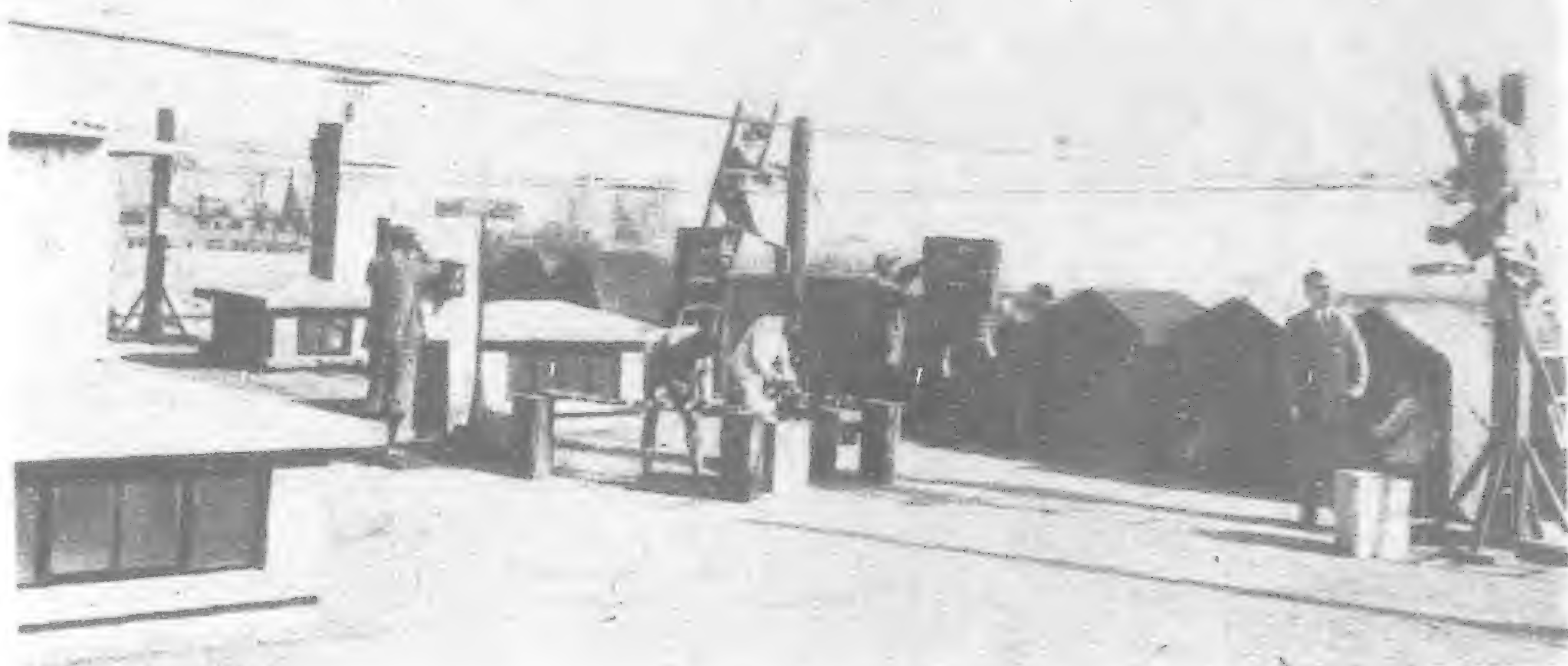


Fig. 5.—A Section of the Roof School

other, and to extension instruments arranged on the walls of the room, while single instruments and wiring plans are connected via the model cable distribution scheme to the automatic demonstration unit. With the aid of the foregoing equipment, such work as testing, fault location, adjustments, and general maintenance is taught and carried out practically under field conditions, while special training in relay adjustments can be given as required on the practice frames which are referred to later in connection with the Machine Adjustment Course.

During the training of men concerned with work on subscribers' premises, special attention is paid in a series of short lectures, to general deportment and to care of subscribers' property. During these lectures, the men are taught the importance of observing good manners; to practice care and cleanliness in their work; and to assist subscribers in the choice of location for apparatus when such assistance is required. These are important features, since the relations established by these men not only materially affect the status of the company in the eyes of the public, but are a big factor in fostering the goodwill and co-operation of subscribers.

The training of staff for the maintenance of automatic exchanges is a subject which, more than any other at present being dealt with in Shanghai, requires a great deal of preparatory work before the practical aspects of the subject can be touched upon. This is particularly so where entirely new men are concerned, and even, as has been the case in Shanghai, where existing staff must be trained to handle a new system.

Following the considerable amount of preliminary tuition in electricity and magnetism and elementary telephony which must form the basis of almost every branch of plant training, the students are taught the principles of automatic telephony; the layout of the system; the various call routes; and the construction principles and characteristics of every piece of apparatus employed. Then comes a series of touring lectures in one of the automatic exchanges, during which the students are given an opportunity for studying the apparatus layout, cabling, and general operation. Following this, instruction is given in circuit reading, circuit operation, and the use of wiring diagrams; after which, call tracing, fault location, and general maintenance is dealt with in detail.

The automatic demonstration unit is found to be extremely useful during this training, since it provides a comprehensive view of the whole sequence of operations; it is particularly useful during the preliminary lectures, and later, during lectures and practice on fault location.

The somewhat difficult subject of circuit training is dealt with by first giving instruction in circuit conventions and general circuit knowledge. Following this, and after the function of the circuit and the layout of the diagram in hand has been clearly explained and understood, each portion of the circuit is dealt with consecutively by showing the complete circuit and simplified



Fig. 6.—A Portion of the Temporary Cable Jointing School Used During the Conversion Period

sketches of its various parts on the screen, and by training the students to follow the operations on practice diagrams under the guidance of the teachers. Special efforts are made to teach the students to build up their knowledge of the circuit from their understanding of the functions it has to fulfil. Further assistance is given by issuing to each student a copy of all the more important diagrams, together with detailed circuit descriptions for home study and future reference purposes. The foregoing constitutes a preliminary course which usually lasts from three to four months, after which the students are posted to an exchange, there to apply their knowledge and to gain experience. Subsequent training includes a Machine Adjustment Course which is carried out with the aid of fifteen special frames which are installed in the school. Each of these frames is equipped with one line finder, one sequence switch, one step-by-step switch, one rotary selector, one time alarm switch, one message register, and two sets of relays, together with some typical gears and shafting, and a plug and socket arrangement for obtaining the necessary current when carrying out electrical tests. The two sets of relays referred to comprise one set of typical relays such as are used in the exchanges, and one set of old relays which are used for giving preliminary training in the use of adjusting tools. These frames, one of which is shown in Fig. 7, are constructed of angle iron and flat iron bars recovered from old apparatus racks, and they are mounted on wooden bases so that they can be moved to suit lighting or class arrangements as required. The frames are numbered to facilitate supervision, and the equipment is so arranged that all adjustments can be carried out under practically the same conditions as obtain in an actual exchange.

A brief description of the method of conducting the Machine Adjustment Course follows. Since similar methods are adopted in all other courses, it will serve to illustrate the general training procedure.

As for most other courses, special work sheets for each separate part of the course are prepared by the school and issued to the students for use during lectures and practice, and for home study. These work sheets, which are stencilled in single space type on foolscap, are written in as clear and simple a manner as possible, and are intended to convey all essential information, much of which, under other circumstances, would have to be dictated to, and noted by, the students during lecture time. A considerable amount of valuable time is thus saved, and the students are assured of correct information for studying and for future reference purposes. The work sheets issued during the Machine Adjustment Course consist of ninety pages containing general information regarding the care of equipment, detailed instructions covering inspections, tests, adjustments and replacements, explanatory drawings and data for use when carrying out adjustments on the practice frames.

The preliminary lectures during this particular course deal with the care of tools, explanation of data terms, the uses of current flow test sets, and other general adjustment knowledge. When these points have been covered, each piece of apparatus is taken in turn as a separate part of the course, and is dealt with in the following manner:

The first step consists of a brief revision of the construction and characteristics of the apparatus in hand, and instruction in ordinary care and maintenance, including lubrication where necessary. The students are then taught the proper uses of the various tools and are allowed to spend an appreciable amount of time in practicing these uses on old apparatus under close supervision. Next, each separate test, adjustment or group of adjustments is dealt with by

means of illustrated and demonstrated lectures, after which the students are required to carry out the work on their respective frames under the supervision and guidance of the teachers and with the aid of their sheet notes and data. When all adjustments on a particular piece of apparatus have been dealt with in this manner, the apparatus is placed completely out of adjustment, and the students are required to carry out a complete check and readjustment, as far as possible unaided by the teaching staff. After the satisfactory completion of this work, further instruction and practice is given in dismantling, reassembling and replacement of parts, this being followed by a further complete check and readjustment.

The foregoing procedure is followed throughout the course with very satisfactory results, and the total time taken by full time classes is divided up roughly as follows:

Key, jack, and message register adjustments ..		20 hours
Relay adjustments ..		68 hours
Line finder adjustments ..		40 hours
Group and final selector adjustments ..		57 hours
Sequence switch adjustments ..		35 hours
Step-by-step switch adjustments ..		45 hours
Time alarm switch adjustments ..		20 hours
Total time ..		285 hours

A photograph of a Machine Adjustment Class at work is shown in Fig. 4. This picture, incidentally, also shows the Epidiascope in the center foreground and a portion of the school museum in the glass cases on the left.

In common with the procedure followed during all other full and part time courses, a system of close observation and marking, coupled with a series of tests and examinations which are conducted periodically, serves to provide a record of progress which enables the school staff to classify the students according to their ability. This record is used in the compilation of a final report which shows details of progress and includes opinions and recommendations, and which is submitted to the Division Chiefs concerned when the men are returned to normal duty.

A follow-up card for each individual student is prepared and maintained by the school for one year following the conclusion of each course; this card contains details of the student's record of service and his progress during training, and it also provides space for four

separate field reports which are supplied by the respective Division Chiefs, to whom the cards are sent at the end of each three months. A record of the student's progress subsequent to training is thus obtained, and can be made use of in the organization of review courses, if and when such are required.

The foregoing paragraphs outline a few of the more important types of training which are carried out by the school. A number of other subjects have been dealt with in a similar manner, such as courses covering the Police Street Telephone System, Teleprinter work, the training of test clerks, and general testing (covering the uses of Tone Test Sets, the Megger and the Wheatstone Bridge). With regard to the training of test clerks, an interesting arrangement is shown on the center panel of the wire chief's desk in Fig. 2. This consists of twelve two-way keys and an associated test jack, which are used to teach the men to recognize and understand all the various line conditions which are met with in the field. The keys are connected in various ways to battery, ground, condensers, resistances, and other apparatus located inside the desk, so as to facilitate the connecting of the various line conditions, via the jack and a testing cord, to the testing circuit. Thus, a testing student, merely by inserting a test cord into the jack, and by

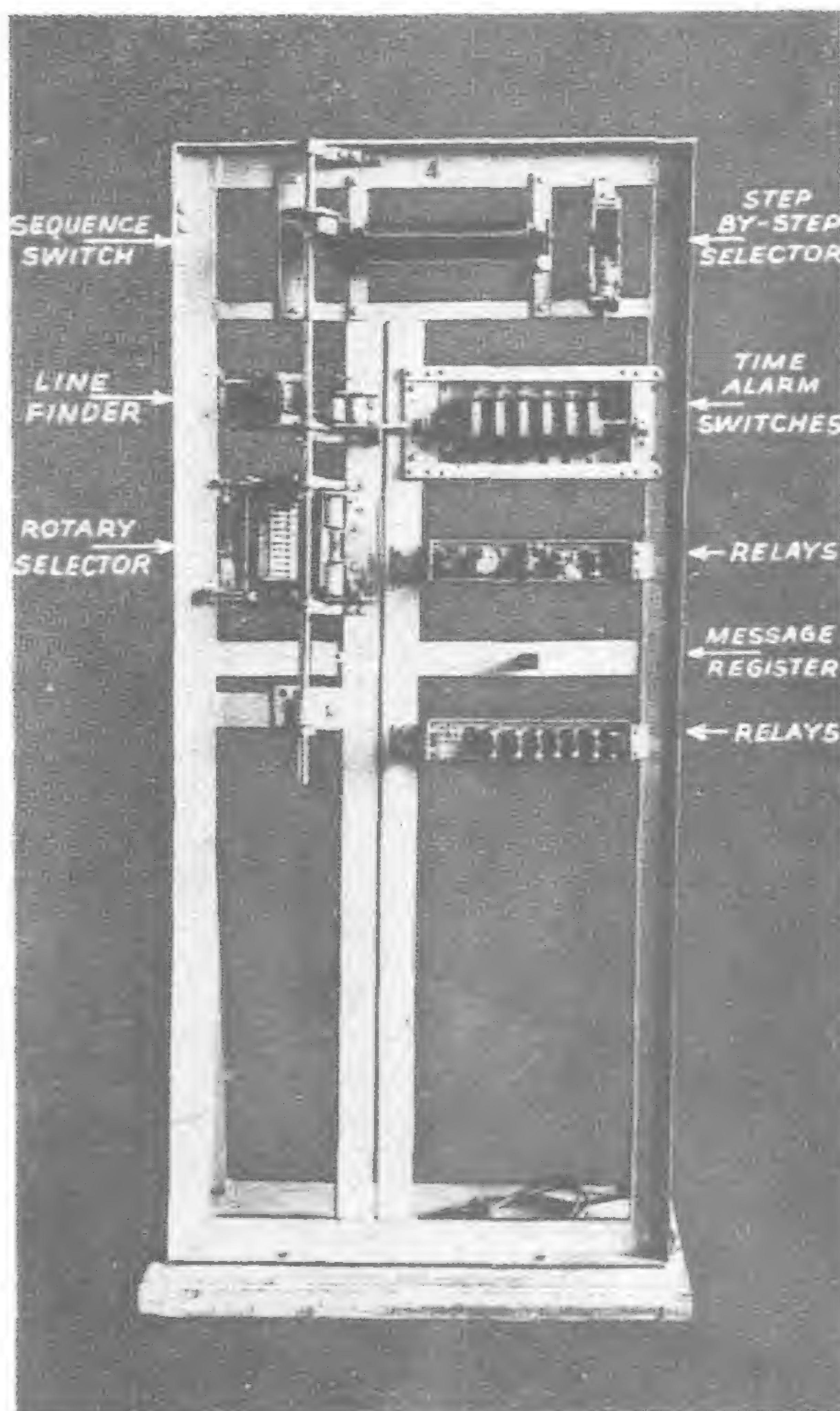


Fig. 7.—Apparatus Frame Used in Machine Adjustments Training

operating one of the condition keys in conjunction with the various testing circuit keys, can observe and study any line condition, such as low insulation resistance, battery and ringing contacts, condensers in series and parallel, short circuits, grounds, normal conditions on subscribers' lines and trunks, etc. Adjacent to each condition key is a simple diagram showing the testing circuit conditions in light line, and the conditions of the supposed circuit under test in heavy line. This arrangement is found extremely useful, not only during the preliminary stages but throughout the testing course.

One type of training which is worthy of mention, is the organization of short courses to cover rush job requirements. This type of training was found particularly useful during the conversion period, when large gangs of men were brought into the school for one or two days only, and were taught the most efficient and expeditious methods of carrying out cutover or conversion work, such as the fitting of duplicate apparatus in subscribers' premises, fitting of dials to C.B. instruments, etc.

As already mentioned, evening classes are conducted over eight months of each year, the school being closed to evening classes only during the very hot season. These classes are entirely voluntary and are very popular, large numbers of the staff, both foreign and Chinese, taking advantage of this method of revising or improving their knowledge. In passing, it may be of interest to note that the foreign staff referred to, comprises several different grades and nationalities, and includes men specially engaged and brought out from various western countries, together with a number of locally engaged British, Americans, Russians, Japanese, Portuguese, etc. During the 1932-1933 session, ten separate classes were conducted weekly and, including a certain number of men taking more than one course, the evening class roll carried no less than 512 students. The subjects covered included several of those already mentioned, as well as various special classes dealing with such subjects as Service Order Practice, General Telephone Knowledge classes for Traffic, and Commercial Staff, etc.

Evening classes during the 1933-1934 session, comprised seven separate classes for which 330 students enrolled. The program included a series of lectures on Economics and another on Teleprinter work, while an interesting departure was the inauguration of a special discussion course on subjects leading up to a study of Carrier Current and Wireless Telephony. This latter course, attended by 76 foreign and Chinese students, was conducted along somewhat unusual lines, in that a portion of the lecture work was carried out by the students themselves under the guidance of the teaching staff. Under this scheme, certain members of the class volunteered to make a particular study of a portion of the syllabus, one man taking the subject of vacuum tubes, another taking amplifiers, and so on, while the remainder of the class was required to make a general study of the various subjects in accordance with the syllabus. The course followed a progressive schedule, and each subject was dealt with by the student concerned in a series of short illustrated and demonstrated lectures, each lecture being followed by a discussion period. This class was exceptionally keen, and the scheme shows promise of being very successful. The work covered provides useful revision for the more advanced students, and also enables the members of the class as a whole to improve their knowledge of communications developments.

In addition to its normal function of training plant staff, the school has proved of considerable value in the training of P.B.X. operators, and also in the training of salesmen and business office staff in the rudiments of telephone work and a knowledge of subscribers' apparatus and facilities. The value of the latter training, which consists of lectures and demonstrations in the school and one month spent on a touring course throughout the various divisions, cannot be exaggerated, since it enables the man behind the counter, or the canvasser, to conduct his business in a much more convincing and efficient manner.

The foregoing has dealt with staff training activities which are carried out entirely by the Education Division. A certain amount of training is also constantly being conducted in the field, more especially by the Traffic Department, which is continuously training supervisors and operators in new and revised routines and operating procedures.

The question of staff education is one which undoubtedly presents many difficulties wherever it occurs, but in Shanghai these difficulties are added to by conditions which are not usually encountered in western countries. Among these is the low standard of education of the average Chinese workman, particularly in a

technical sense, which necessitates the considerable lengthening of the training period, and also results in a somewhat lower general standard of efficiency being obtained than in many other parts of the world.

In passing, it may be said that one of the greatest drawbacks to technical education in Shanghai has been the lack of a properly organized technical college, which could be made use of by the large numbers of youths who may be desirous of entering the various engineering trades and professions. The present indications are, however, that this deficiency will soon be made up, since there are prospects of having an up-to-date establishment in the near future in the form of the Lester School and Technical Institute.

Another great difficulty experienced in Shanghai is that of language; this is not merely a question of English and Chinese, but of many different Chinese dialects. In China, it may be remarked, a dialect is practically a language in itself. Thus, in Shanghai, where the Shanghai dialect, of course, predominates, a native may find considerable difficulty in speaking to, or understanding, a man from the north or south of his own province, and much greater difficulty in conversing with natives of other provinces. The conditions arising in this respect may be imagined, when it is realized that large numbers of natives from all over China are found in Shanghai, and that it is no uncommon thing to find two Chinese attempting to converse in pidgin-English, or using an interpreter who is familiar with both their dialects. This aspect makes itself felt very keenly during training, since classes often comprise men from several different provinces. There is also the fact that there are no equivalents in the Chinese tongue for the various technical terms and it has been found that, prior to training, many of the men were in the habit of using Chinese terms indicating things which possessed some physical resemblance to the apparatus in question. For example, a slow speed time alarm switch was referred to in the Chinese term for "tortoise"; a black box containing a wiring plan switching key as a "small coffin"; a telephone connecting block or orsette as a "baking cake"; a dial as a "watch" or sometimes as a "plate," etc. It is therefore very necessary to teach students to interpolate the correct English term when writing or speaking of the various pieces of apparatus in their own language.

Other difficulties encountered are those bound up with the characteristics of the Chinese. For example, due to their innate passivity, it is extremely difficult for a foreign, or even a Chinese teacher lecturing to a class of Chinese, to know whether his teachings are being understood or not whereas, with a foreign class, it is generally easy for a teacher to gauge the degree of interest being taken in the subject by each individual student. Further, particularly during the early training stages, it is practically impossible to induce Chinese students to ask questions or even to answer them; this, it is thought, is due in part to the fear of "losing face."

Most of the foregoing difficulties are, however, overcome by the exercise of patience and perseverance. Despite his handicaps, the average Chinese workman is on the whole, quite a good type. When properly trained and carefully supervised, a great many prove very satisfactory and compare favorably with workmen more fortunately placed; they possess considerable natural manipulative skill and are generally very willing and hard workers. By many, they are credited with having exceptional memories, but this opinion probably arises from the fact that the Chinese use their memories to a much greater extent than do the westerners. For example, a Chinese student taking an examination will frequently give an answer coinciding almost word for word with the work sheets from which he has been studying, while making some small slip which proves that the real meaning of the subject is not thoroughly understood. It is also quite a common occurrence to find a Chinese wireman repeatedly carrying out a fairly complicated wiring scheme without reference to a diagram: whereas, if the same man were presented with a similar scheme with which he was not familiar, he would probably find considerable difficulty in immediately proceeding with the work. This memorizing habit, which is not encouraged during training, is probably due to a great extent to the trait of passivity already mentioned, in that this tends to make memorizing a more congenial method of learning than critical, analytical reasoning and assimilation.

In conclusion, while the results obtained undoubtedly justify the effort expended, it will be realized that the process of making reliable telephone men of Chinese of the working classes is no easy matter, and that the training procedure must necessarily be very slow and demonstrative.

Record of Progress in Civil Aviation is Disclosed in the U.S.S.R.*

CONSIDERABLE progress was made by civil aviation in the U.S.S.R. during the past year. The total length of the main lines in operation is now 43,000 kilometers, having increased by about 7,000 kilometers over 1933 and by 16,400 kilometers since 1930. In addition there are some 25,000 kilometers of local lines.

Operations during the first nine months of 1934 increased more than 75 per cent as compared with the corresponding period of 1933. Passengers carried by the main lines during the January-September period totalled 51,500 as against 42,500 for all of 1933. Mail carried totalled 2,354 tons, and freight—2,485 tons, showing substantial gains over 1933, while the distance flown more than doubled for the nine months, amounting to nearly 16 million kilometers. Total aeroplane operations in ton-kilometers for all of 1934, amounting to 5.5 million, increased by 76 per cent over 1933.

Civil aviation is of exceptional importance to the Soviet Union with its outlying territories still lacking adequate transportation and communication facilities. The first airline, operated by a Soviet-German joint stock company called "Deruluft," was established in 1922. This line links Moscow with Berlin and other European capitals. The real beginning of Soviet civil aviation, however, dates from 1923, when the U.S.S.R. commenced to build up its own civil air fleet and to establish regular air-lines throughout its territory. Progress during the subsequent years was rapid, and by 1932 the U.S.S.R. ranked third in the world as regards length of airlines, second with respect to airmail and aerial photography, and first as regards the use of airplanes in forestry and agriculture.

The growth of Soviet civil aviation during the period 1925-1933 is shown in the following table:

	1925	1928	1932	1933
Length of lines in operation (thous. km.)	5.0	11.4	31.9	37.0
Distance flown (mill. km.)	0.9	2.8	7.0	—
Passengers carried (thous.)	6.1	10.6	31.6	42.5
Mail carried (tons)	13.4	93.2	430	1,986.2
Freight carried (tons)	72.3	162.2	447	1,470.5
Aerial photography (thous. sq. km.)	0.9	30.7	115.0	151.2
Agricultural and forest land treated against pests (thous. ha.)	2.5	32.9	1,028.6	1,152.7
Sowing by airplane (thous. ha.)	—	—	58.0	137.5

Particularly rapid growth has been recorded in the transport of mail. More than 20 times as much mail was carried by air in 1933 as in 1928.

In 1930 only one air service was operated throughout the year; now practically all lines maintain year-round service. The network of airlines embraces—in addition to the Moscow-Riga and Leningrad-Riga lines, which constitute sections of the international lines operated by Derulft—such important trunk lines as:

1. Minsk - Moscow - Sverdlovsk - Novosibirsk - Irkutsk - Khabarovsk - Vladivostok (8,847 km.);
2. Leningrad - Moscow - Kharkov - Rostov - Baku - Tiflis (3,675 km.);
3. Moscow - Samara - Orenburg - Aktyubinsk - Tashkent (3,049 km.);
4. Moscow-Kazan-Ufa-Magnitogorsk-Karaganda-Alma-Ata;
5. Vladivostok - Sakhalin - Kamchatka (5,000 km.).

Soviet airlines cross the frozen tundra and dense forests of the Far North and Siberia, the deserts of Kazakstan and Central Asia, and the high peaks of the Caucasus Mountains. The most remote places in the U.S.S.R., such as Yakutia, Kamchatka and Sakhalin Islands, are reached by airlines. For many sections not



Bringing Medical First Aid by Aeroplane to a Collective Farm 130 kilometers from Kharkov (Ukraine) Within an hour of the time of the accident the Plane arrived and the Victim was taken to Hospital in Kharkov

only of Siberia and the Far East but of Central Asia and Kazakstan the airlines constitute the only means of mechanical transport and mail communication. Airlines connect regional and district centers; the largest industrial plants and state and collective farms have air service.

The network of airports and landing fields grows from year to year, but only the Moscow and a few of the other airports and landing fields can be considered in the first rank as regards equipment and facilities.

In addition to the transport of mail, freight and passengers over established routes, many special expeditions are made for various scientific purposes. For instance, in 1933 flights in the Arctic regions totalled 232,000 km. The work done by aviators in assisting Arctic expeditions of Soviet icebreakers and in searches for lost airship crews, such as that of the "Italia" and the American aviator, Carl Ben Fielson, is well known. The Soviet aviator Levanevsky, made a long and perilous journey in the summer of 1933 to come to the rescue of James Mattern, the American aviator stranded in the far northeastern corner of the U.S.S.R. on his attempted solo flight around the world, and piloted him safely across Bering Strait to Alaska. The heroic exploits of Soviet aviators in effecting the rescues, last year, of the 104 members of the "Cheliuskin" expedition marooned in the Arctic ice, aroused the admiration of the world.

Airplanes have for a number of years participated regularly in hunting and fishing expeditions, locating seal herds and fish schools, guiding the boats through the ice, transporting young herring and other fish from one breeding place to another, etc. Planes likewise accompany the annual Kara Sea trading expedition, which sails from European ports to the mouths of the Ob and Yenisei rivers on the Arctic Ocean. In 1933, for the first time in history, freight vessels, guided by an airplane, made a journey to the mouth of the Lena River.

Aviation in Surveying, Agriculture and Forestry

Among the many other diverse uses to which Soviet aviation is applied is aerial photography. Aerial surveys in 1933 covered an area of 151,000 sq. km., five times as great as in 1928. Aerial photography has proven especially valuable in cartographic work in connection with the planning of new economic regions. Since 1931 this branch of aviation work has been placed under the jurisdiction of the Chief Geodetic Survey.

In the field of agriculture and forestry Soviet aviation has recorded notable achievements. This branch of aviation work

*Economic Review of the Soviet Union.

was first undertaken during the period of the first Five-Year Plan, and by 1931 the U.S.S.R. had risen to first rank in this field. The principal services are: airplane sowing, destruction of pests, photographic surveys, preventing and extinguishing forest fires, transport on large state and collective farms, rush delivery of spare parts for tractors, air mail service for sowing and harvesting, correspondence, etc. Airplanes used on agricultural services flew a total of 45,000 hours in 1933 as against 13,000 in 1932. In 1934 this was scheduled to reach 102,000 hours.

In 1932 over 10 million hectares of forests were patrolled by airplanes in combating fires, 429,000 hectares of farm and forest land were cleared of injurious pests by airplane dusting, and 58,000 hectares of land were sown from the air. In 1933 the patrolled forest area was doubled and sowing from the air increased to 137,500 hectares (340,000 acres). In the first nine months of 1934 airplane sowings increased by a third while the area cleared of plant pests by means of chemicals rose to a total of 1,634,000 hectares.

Sowing by airplane is accomplished at a rate of from 12 to 50 hectares per hour, about ten times the speed of tractor sowing, and the yield is often from 20 to 25 per cent higher. For extra-early spring sowing, when the soil is too wet for machine sowing, the airplane has proved of exceptional value. Airplanes have also been used effectively in fighting early frosts by spreading smoke clouds over planted areas, particularly orchards and vegetable gardens. First experiments have been made in applying mineral fertilizers by air.

The agricultural air fleet has recently assumed the task of fighting the malarial mosquito. In 1932 the larvæ of malarial mosquitoes were destroyed over an area of 586,000 hectares of water surface, while in 1933 the area covered amounted to 751,000 hectares. This has been found to be the most rapid and effective method of combating the spread of malaria.

Aviation Industry

Prior to 1928 Soviet aviation depended largely on foreign airplanes and motors. Domestic manufacture of airplanes, motors, and aviation equipment was established during the first Five-Year Plan period. At the present time practically all planes in service on Soviet airlines are of domestic make. The production of airplane motors, both air and water-cooled, has been organized, and motors up to 700 h.p. are now being built in Soviet plants. All types of modern planes for civil and defensive uses are now manufactured in the U.S.S.R. Notable progress has been made in designing and constructing new type of planes—the all-metal, five-motor, 36-passenger monoplane, ANT-14; the all-steel, electrically welded planes, Stal-2, Stal-3, Stal-5, and Stal-6, tailless planes, amphibians, auto-giros, gliders, etc. Important research and experimental work in airplane construction is carried on at three aviation institutes. The foremost of these is the Central Aero-Dynamics Institute (TSAGI) in Moscow.

A special trust for dirigible construction was organized in 1931, since which date several airships have been designed, built and tested with success. First five small experimental ships (four non-rigid and the fifth semi-rigid), ranging in size from 2,150 to 6,800 cu. meters, were built. A medium-sized semi-rigid airship of 20,000 cu. meters was completed a few months ago, and a giant dirigible of 50,000 cu. meters is being designed. Umberto Nobile, former commander of the "Italia," is serving as consultant for the Soviet dirigible construction trust.

The growth of civil aviation in the U.S.S.R. has necessitated the training of many qualified pilots, mechanics, instructors, etc. There are now several aviation training schools in the Soviet Union, where skilled airmen are prepared. Interest in aviation is becoming widespread among the population. Aviation clubs and glider schools have been organized in many towns, and glider meets have been held from time to time at which several world records in glider flying have been broken. Through a popular organization known as "Osoaviakhim" (Society of Friends of Aviation) with a membership of many millions, the general population has contributed funds for the building of many airplanes. Special interest was taken in the construction of a huge, 8-motor airplane, named after Maxim Gorky, which is the largest land plane ever constructed. It is being used for educational purposes and carries its own printing apparatus, broadcasting equipment and movie projector. The Maxim Gorky's motors have a capacity of 7,000 h.p. and its weight is 43 tons. It is constructed and equipped almost entirely with Soviet materials.

The year 1933 witnessed an event of great significance in aviation, the successful flight of the Soviet stratostat "U.S.S.R." into the stratosphere. The stratostat, which was of Soviet design and manufacture, attained an altitude of 19,000 meters (60,352-ft.), as against the previous world record of 16,200 meters reached by the Belgian physicist, Professor Piccard. During the flight of the Soviet stratostat, which took place September 30, 1933, constant radio connection with the earth was maintained and important scientific observations recorded. In January, 1934, a flight by a second Soviet stratostat, the "Osoaviakhim," ended in the destruction of the balloon and crew after the record height of 70,000 feet had been reached. Further researches are being made with the object of determining the feasibility of establishing superspeed air routes in the higher atmospheric strata.

During the second Five-Year Plan Soviet civil aviation is scheduled to record rapid progress along the lines outlined above and in addition new forms of service are to be developed. The length of through airlines will be increased to 85,000 kilometers in 1937 as compared with 37,000 in 1933. Local lines are to expand from 14,000 to 35,000 kilometers. The number of passengers carried in 1937 (1,500,000), the amount of mail (36,000 tons) and of freight (15,000 tons) are scheduled to increase from 10 to 35 times as against 1933.

U.S. Security in the Pacific

(Continued from page 124)

The weak spot of our protection in the Pacific thus is the Philippines. These islands are 4,500 miles from Hawaii via Guam. Manila is defended by fixed fortifications, a mobile army, an air force, and submarines. How impregnable the fortifications may be might be imagined when we know that they have by treaty remained in *status quo* since 1922.

There exists no adequate naval base for the fleet in these islands. Therefore, after the arrival of the fleet in the Philippines, it could not expect to enjoy as complete mobility as if the base were adequately stocked with fuel and supplies, available for refit and repair of the several units of the fleet, even if amply protected by impregnable fortifications and a powerful mobile army, including air forces.

"Weakness in Alaska"

Alaska is the next weak link. These possessions are within range of a fleet given mobility from the base in Hawaii, but advance bases will be needed in Alaska to deny occupancy by an enemy's warships of the many harbors that would otherwise be available for his small surface ships, submarines, and aircraft.

It is being recognized in this country that the Philippine islands are an important spearhead for our trade in the Orient. It seems certain that the future will prove the great advantage, to both the United States and the Filipino people, of continuance of United States protection for the islands to prevent them from falling under the hammer of the highest bidder for economic benefits, which might change the whole complexion of the security of our trade in the Orient and reduce the Filipinos to a subject people.

If the United States expects to remain secure in the Pacific area, the mobility of its fleet must be assured, and this can be done only through the creation of adequate naval base facilities.

The United States, with its intention of building up its defensive elements in the Pacific, will be faced by the delicate diplomatic mission of assuring Japan of the purely defensive character of its undertakings. Japan and the United States have for years been selected by the world at large as the principals in the next war in the Pacific. The common sense of the people of both countries and the importance of the trade between the two nations seem sufficient evidence to discredit the credibility of such propaganda.

Preliminary Report on Water Power Development in Shansi

By O. J. TODD, Chief Engineer, China International Famine Relief Commission

(Continued from March, 1935)

A STUDY of the topography and comparative costs shows that the head-race should be chiefly in tunnel rather than in open channel. The tunnel section will be approximately 30 feet high by 50 feet wide and between 4,000 and 5,000 feet in length depending on more detailed rock studies. Canal velocity will be approximately five feet per second. Regulation of flow in the canal or tunnel will be by intake gates when the water level is such that throttling is necessary. Two sets of gates at the lower end of the head-race will also be provided so the flow may be diverted into the main river when it is necessary to close the plant.

Design of the power plant has been worked out in sufficient detail to get fairly reliable preliminary cost estimates. These include penstocks, powerhouse, turbines, generators, transmission line, etc. Account has been taken of the main details of intake design as well. A road survey taking many weeks has been completed from near Pingyangfu to Huk'ou in order to compute freight costs. Another survey is being made of a road from Hotsin (near Yumenk'ou) to the falls in the hope of finding a less expensive route over which to build. Our engineers have made broad enough investigations to warrant the drawing up of this preliminary plan that is subject to certain alteration but points the way to the economical development of this unused power.

Costs

As is shown in some detail in Appendix I, the cost for developing these Yellow River Falls is very reasonable. For the proposed primary stage of development where the plant will produce 50,000 horse-power the cost totals a little over \$6,000,000 exclusive of interest on the capital. If this must be borrowed for two years at eight per cent then the item of nearly \$1,000,000 for interest should be added. It is likely, however, that the work can be so laid out that the main construction expense will be incurred in less than two years time.

Our computations show that this plant running full capacity all the time can produce electric energy and transmit it 60 miles to the Yumenk'ou region for pumping or industrial purposes selling it for three cents per kilowatt hour. This is on the assumption of complete use of all power so produced. It is the ultimate minimum rate toward which the builders of this power utility may hope to

work. The cost per horse-power will be slightly over \$140 for plant construction, etc.

The annual charges against this project are calculated at \$990,000. These include "Capital" charges of six per cent and "Depreciation and Obsolescence" charges of a like amount, as noted in Appendix I. Lands and riparian rights are taken at a low figure as the country is practically uninhabited around the falls and following down river to Yumenk'ou. Though our engineers have carefully surveyed the 100 mile road reaching the dam site from the east and find it will cost fully \$700,000, other surveys may show a saving on this item. Cement costs are predicated on present methods of supply. If Shansi has her own cement plant operating next year and her railway materially reduces transport costs, a saving can be made on the cost of the dam below the \$1,000,000 provided in the estimate. It should be noted that a contingency factor of 15 per cent is allowed over all construction costs. That is low enough in figuring work in such isolated regions of China.

Benefits and Uses

When the question of hydro-electric power development is raised everyone asks how a large supply of new power will be used in the interior of China, for in most localities it must compete either with low priced hand labor or cheap steam power where coal is abundant. A few of the possible markets may be tabulated as follows:

- (1) Yumenk'ou Pumping Plant for irrigation.
- (2) Lungmenchu Pumping Plant for irrigation.
- (3) Hotung Pumping Plant for irrigation.
- (4) Cotton Spinning Mills at Chiangchow.
- (5) Other mills and industries to be built nearby.
- (6) Lighting nearby cities.
- (7) Tungkwan municipality and railroad shops and industries.
- (8) Coal mines in south Shansi.
- (9) Petroleum distillation and refining in central Shensi.
- (10) Electrochemical industries—Fixation of Atmospheric Nitrogen.
 - (a) Fertilizers
 - (b) Nitric acid
 - (c) Pulp products



Lower Chu Wo Falls six miles east of Chu Wo, Shansi.
April 13, 1934



Gorges of the Yellow River north of Yumenk'ou, Shansi



Yumenk'ou where the Gorges of the Yellow River end

With the many opportunities to dispose of this new power as indicated above it seems likely that the entire output of this first development may be economically employed within less than five years of the completion of the Hu-k'ou power plant. Though the very important use connected with the new irrigation districts proposed for south-west Shansi will be seasonal, it is likely that a Nitrogen plant could be so operated as to take up the unused power at other times of the year.

The development of these falls of the Yellow River will mean new life for all of south Shansi as well as neighboring regions. This potential power should not continue a complete loss to the State as it has down through the centuries. It is within the ability of Shansi to-day, with moderate aid from the National Government, to so utilize this power that many millions of her people will benefit by the increased prosperity that will accrue to the province.

Foreign specialists investigating lands in China have stated that the climate and soil of south-west Shansi is particularly adapted to the growth of cotton. This is a valuable crop bringing in larger revenue to the farmer than do most grain crops. With irrigation cotton does well throughout the Hotung area even including districts as far north as Pingyangfu. To get water to the higher lands of Hotsin and Wanchuan hsiens it is necessary to have cheap power for pumping. To do this pumping, to manufacture the cotton into yarn, to grind grain into flour, to light cities and otherwise modernize this part of Shansi will be a part of the benefits that these Yellow River Falls may confer on the nearby country. Added to these the production of nitrates for



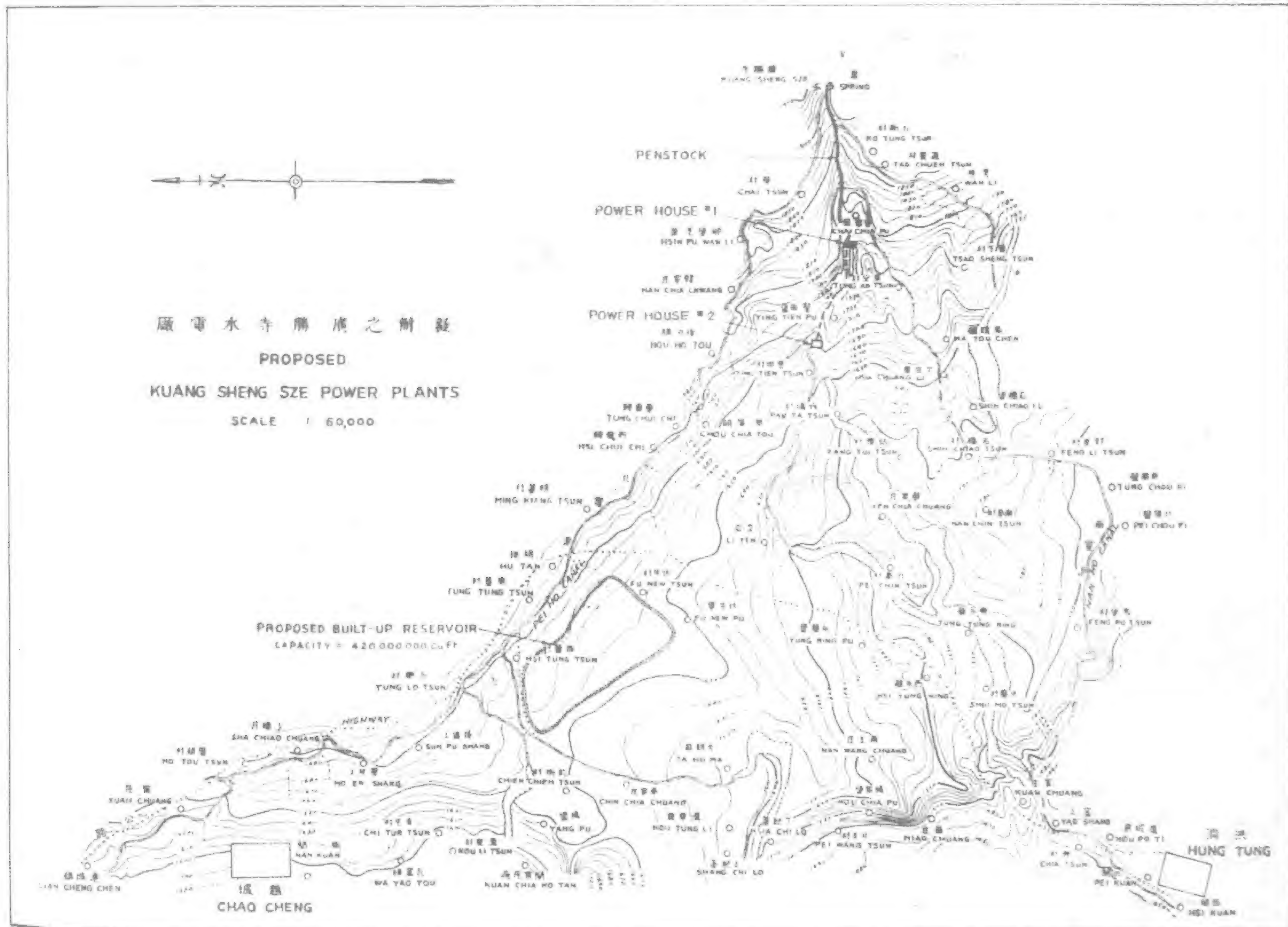
A Flow of 100 cubic feet per second from Kwang Sheng Sze Springs north-east of Hung Tung, Shansi

use in fertilizers will prove a very important factor in keeping up high production in agriculture.

Kwang Sheng Sze Spring Project

The Kwang Sheng Sze Springs, located at the foot of limestone hills, are well above the plain, lying to the west between Hung Tung and Chao Cheng, which they water, and are at an elevation such that the flow of nearly 100 second-feet can eventually be used to develop 2,600 horse-power of electrical energy. The first development, however, will furnish only 1,400 horse-power.

PLATE VII





On the Hotung Plateau 310 feet above the Fen Ho and to the south of Hotsin Pumping Station



Cotton Fields on the Dry Hotung Plateau 310 feet higher than the Fen Ho

The flow from the springs is divided into three main canals and along these native mills make use of the power of low drops of four to six feet each. Later the water is released to be used by irrigationists. These small native mills for grinding flour are of low efficiency. A central flour mill operated by power from a hydro-electric plant would do all the work of these many native mills and still leave most of the power for other uses, such as lighting the cities of Pingyang, Hung Tung and Chao Cheng beside operating various industries.

What new industries would likely grow up near this power plant, aside from cotton mills and flour mills, is a matter of speculation. But it is a good farming region. Canneries for vegetables might easily become profitable enterprises here. The manufacture of cloth by modern methods might prove a thriving business also.

For developing the first unit of 1,400 horse-power or 1,000 kilowatts the entire flow of 100 second-feet would be used with a head of 150 feet at a point 8,000 feet west of the springs. The second development would be built later and utilize an available head of 80 feet.

The cost of developing this water power is estimated at approximately \$180,000, or nearly \$130 per horse-power. Annual operating costs figured at \$40,000 would give power at 45 cents per kilowatt hour at the switch-board assuming full use of the power throughout the year. While this is 50 per cent higher in cost than the larger Yellow River Falls development, it is a low rate that should induce enterprising men to build mills or factories in this district.

The Chu Wo Falls Project

The Chu Wo Falls are located directly below a group of springs in the hills 20 *li* east from Chu Wo city near the village of Pai Shui Tsun and Ching Ming Tsun in southern Shansi. The flow of the stream fed by these springs seems to vary from 20 to 30 second-feet. For years small native flour mills and cotton seed oil presses have held water rights along the small canals leading from the stream above these falls. Here, as elsewhere in China, the power of falling water is inadequately conserved or but partially used.

This project has the highest head and smallest flow of any of these covered by this report. The dependable flow has been taken at only

20 second-feet and the head at 223 feet as per surveys and gagings made last spring by our engineers. There will be but one unit of 400 horse-power capacity.

It is proposed to develop these falls by constructing a small low head dam with a 12 hour storage capacity, leading the water from there by an open flume and penstock to a Pelton type impulse wheel from which the water is discharged into the stream channel near the village at the foot of the falls. Below this point the water will again be used for irrigation purposes as it is used at present.

The following uses may be made of the power developed at this plant:

- (1) Flour milling
- (2) Cotton spinning
- (3) Pressing cotton into bales
- (4) Pressing and refining cotton seed oil and other oils
- (5) Lighting Chu Wo, 20 *li* to the west.

The cost of this development is estimated at \$120,000 or \$300 per horse-power, a rate considerably higher than that for the two previously outlined plants. However, due to the rich farm lands in the vicinity and the general prosperity of this region this higher cost is not excessive. Power is of great value to this community so that this small project may well prove worth the investment.

The Chintze Springs Project

These springs, located close to the town of Chintze, Taiyuan Hsien, are well known for their clear water and regular flow. The temples built around them have made the spot a shrine for centuries. The provincial capital is but 40 *li* to the north connected by a good motor road. Coming from the hillside on the western border of the Fen Ho valley these springs are particularly valuable for irrigating lands immediately to the east and south where rice and other grains are grown. The 40 feet of fall before the main valley lands are reached has been used, in the native way, to run small flour mills. But here, as at Kwang Sheng Sze and Chu Wo, the power is wasted and efficiency is low.

While this is the smallest development covered by this report it is important because of the location. Though the 70 second-feet of flow would produce but 250 horse-power of



Leaning Cedar at Chintze Springs

CHIN TZE SPRING AREA
SCALE: 24,000
DETAIL MAP



electrical energy, still this is valuable and can be developed without detriment to the farmers who use this water for irrigation. It can be made to do greater work than at present by centralizing the milling in one plant.

The power would be used in two ways as follows:

- (1) To furnish electric lights to the town of Chintze.
- (2) To operate a central flour mill superseding the native ones.

In addition the temples around the springs might be lighted and the new park that is being created near the springs may have the benefits of electric lights. Milling might be done in the daytime so that the same power could be used for lighting at night.

The cost of this project is figured at approximately \$44,000 bringing the cost per horse-power to nearly \$176. Operation costs and fixed charges are estimated at \$8,800 per year so that the power may sell at 53 cents per kilowatt hour if it is all consumed and the plant runs continuously.

The necessary field studies have been made for this development and preliminary plans have been worked out in some detail. As soon as the Provincial Government is prepared to take the matter up and exercise the right of "eminent domain" the water may be diverted through new channels to the proposed plant and, after being properly used for power, will go back into the same three main canals that now use it for irrigation.

This improvement will be a distinct benefit to this community and be an example for other districts that have water power that is now wasted. The very prosperous community in and near Chintze can easily finance this work. The initiative, however, should come from the Provincial Government to expedite the work and prevent excessive demands for antiquated water rights that are improperly exercised.

The Lower Hotung Irrigation Scheme

The district known locally as the "Lower Hotung" lies south of the Fen Ho and east of the Yellow River and consists of a series of plateaus or benches draining off on all sides to the rivers which surround this high land but chiefly draining into the Yellow River. The city of Wanchuan is on the highest of these benches, being something over 1,000 feet above the Fen Ho at its mouth. But other lands to the west are lower as indicated by military maps. No recent topographical surveys have been made to check up these maps that are used for our preliminary estimates, except for one line of levels from the Fen Ho to Wanchuan made very recently.

The good farm lands of these plateaus are estimated to total 3,000,000 *mou* of which probably 1,000,000 *mou* lie on an average of less than 250 feet above the mouth of the Fen Ho. It is this area that this project aims to serve. The pumping system to be installed near the junction of the Fen Ho and the Yellow River will be operated by low price power from the Hu-k'ou hydro-electric plant described in this report. Water from the Yellow River will be pumped to various levels as the topography permits without the necessity of lifting all of it to the upper plateaus. Likely two or more substations will be required in connection with this pumping. The number, size and location of these stations will be dependent on surveys to be made next year.

Without having the topographic sheets that are necessary before a comprehensive report can be made on the costs and returns of this major irrigation project that so many residents desire, it is possible to work out from the somewhat meagre data the probable costs and returns in an approximate way. Estimates prepared by our engineers and checked against those of other engineers who have considered this project indicate a probable outlay in pumping plant of nearly \$500,000, plus an equal amount for the canal system. This should bring in an annual income of \$1,000,000 from 1,000,000 *mou* of land served. Annual operation and upkeep of the system is estimated at \$350,000, figuring power costs at twice the theoretical minimum.

The benefits of this project would be chiefly in the increase to crop yields, increase to land values, and insurance against drought famines. These benefits would amount to several million dollars each year in the Hotung area alone. As a business enterprise it will pay well, according to calculations made from present maps and figuring on cheap power from Hu-k'ou.

Yumenk'ou Irrigation Project

This project is small but worth while. It embraces an area of 16,390 *mou* of fertile farm land that requires irrigation to insure



Where the boats from North Shansi are unloaded and floated around Hu-k'ou Falls



Where Yellow River boats are again loaded three miles below Hu-k'ou Falls

good crops annually. Cotton grows well here as also do many grains. The lands lie close to the Yellow River immediately north of the Fen Ho near its mouth. The maximum height it is proposed to lift water to this area from the Yellow River by electrically driven centrifugal pumps is 185 feet. Part of the area is very low and can be irrigated without pumping. A two stage pumping scheme will take care of the rest of the area. It is proposed to pump water to this land so that every 15 days it will all get an irrigation of from three to four inches. It is planned to have the first stage a lift of 85 feet. The second stage would be a lift of 100 feet. Details of pumps, motors, etc., have been prepared for this project.

The cost of this plan exclusive of canals is estimated at \$164,000. The canal system should not cost over \$20,000. The cost of power from Hu-k'ou would be a very small item, or little over five per cent of the total annual charges of \$50,000 against pumping plant, interest and depreciation, salaries, etc. It is figured that a plant of 800 horsepower would handle this project. The annual water tax here would have to be \$3 per *mou* to warrant the investment in plant. This rather high charge is due to the small area to be served. However, it is valuable land that should yield \$20 per *mou* annually from cotton.

The topography here is favorable to the construction of a canal system and the cost of excavation should be moderate. The cost of the pumping equipment is the main item to consider in this undertaking.

Lungmenchu Irrigation Project

In the region of Hotsin and Chi Shan an area of approximately 300,000 *mou* of good farm land lying well above the Fen Ho valley

is in need of irrigation. It has been urged by the local people that Yellow River water should be pumped to these plateau lands. The plan is to pump the water from the river at Yumenk'ou and bring it by canal at an elevation of less than 100 feet above the river to the vicinity of Hotsin where a booster station would take care of the additional lift to lands of varying height up to 300 feet above the river.

Surveys are not yet made giving correct topography on which to base a close estimate of costs. With such data as are available estimates have been worked out showing that this project will cost approximately \$1,000,000. Annual charges are estimated at \$350,000 so that the water tax must be something over \$1 per *mou*. However revenues from cotton crops would so increase that the land could stand a tax of \$3 per *mou* each year.

This project would improve conditions in the Hotsin and Chi Shan districts bringing up the price of land served by these canals at least another \$10 per *mou* in value. The annual increase in crop value should average \$5 per *mou* through the region served. The benefit derived by insuring this region against drought would have a marked stabilizing effect on the community.

These three irrigation projects that would be served by pumping plants near Yumenk'ou with power from the Hu-k'ou hydro-electric development are all worthy of consideration. The carrying through of the general plan herein outlined in a preliminary way would mean many millions of dollars of revenue annually to the province above the present income. This plan would so increase land values and crop values that the people's living conditions would be entirely

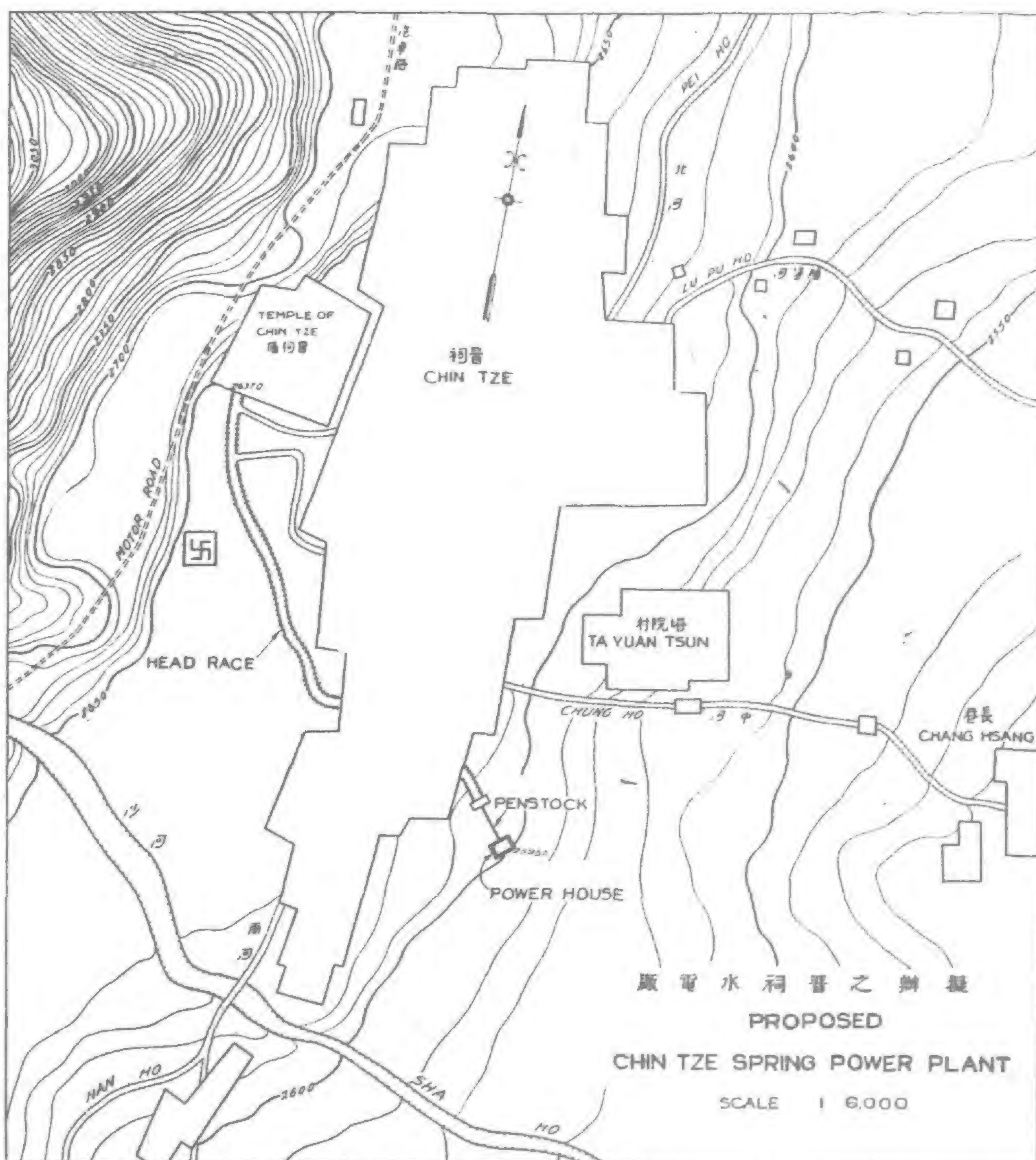


Plate IX

changed within a few years. Prosperity on a scale not heretofore seen in these regions would come to south-west Shansi as a result of these improvements through irrigation.

APPENDIX I.—HU-K'OU FALLS HYDRO-ELECTRIC PLANT COSTS

A. CONSTRUCTION COSTS :

(1) Pingyangfu to Hu-k'ou Road	\$ 700,000
(2) Masonry Dam	1,000,000
(a) Gates and Gatehouse	100,000
(b) Racks and Rake	50,000
(3) Forebay and Controls	50,000
(4) Tunnel, Gates and Spillway	600,000
(5) Penstocks and Valves	100,000
(6) Powerhouse	—
(a) Substructure	50,000
(b) Superstructure	50,000
(c) Equipment	—
(1) 5 Turbines and Appurtenances (wt. 450 tons.)	480,000
(2) 5 Generators and Appurtenances (wt. 300 tons.)	900,000
(3) 2 Transformers and Switchboard	200,000
(7) Freight on machinery from Tientsin \$200 per ton	180,000
(8) Transmission Line (60 miles)	600,000
	<hr/>
	\$5,060,000

B. OTHER COSTS :

(1) Land and Riparian Rights	\$ 50,000
(2) Engineering 5 per cent	255,500
(3) Contingencies 15 per cent	766,500
	<hr/>
Total	\$6,132,000
Interest During Construction (8 per cent for 2 years) ..	981,120
	<hr/>
Total	\$7,113,120
Cost per horse-power	\$142+
Weight of largest piece of equipment	15 tons.
Assuming plant operation for 365 days of 24 hours each the plant will produce annually 37,300 kilowatts for 8,760 hours or 326,748,000 kilowatt hours.	
Expenses per annum :	
(1) Lubricants	\$50,000
(2) Engineers' Salaries and Wages	50,000
(3) Maintenance	50,000
	<hr/>
Total	\$150,000
Capital Charges 6 per cent	420,000
Depreciation and Obsolescence 6 per cent	420,000
	<hr/>
Total	\$990,000

The power can be sold for three cents per kilowatt hour at switchboard if fully utilized.

Gold in Dutch East Borneo

By J. W. DONALDSON-AIKEN in the "Mining Magazine"

IN the novel by Joseph Conrad entitled "Almayers' Folly" mention is made of the wonderful gold deposits located at the headwaters of the Kelai and Segah Rivers, which, uniting at Tandjoeng Redeb, in the Beraoe District of Dutch East Borneo, form the Tandjoeng (point), where there is a small trading in jungle produce—settlement, whence the two rivers flow in one mighty stream to the Strait of Macassar, some 35 miles farther east. The local trade copra, rotans, etc.—is almost exclusively handled by small Chinese traders. The port is served by a fortnightly steamer from Surabaya, Java, run by the Royal Dutch Packet-Boat Company.

Although sporadic attempts have been made from time to time by private individuals to explore the legendary riches of this area it is only now that an organized and properly-equipped expedition, under the direction of a qualified mining engineer, has been sent out to test the truth of the somewhat extravagant native tales. Credit for this enterprise rests with Messrs. Eerdmann and Sielcken, of Batavia, Java, who are also the managing agents for two eminently successful gold-mining companies in Western Sumatra—Mijnbouw Maatschappij Redjang Lebong and Mijnbouw Maatschappij Simau. The former over a 26-year period paid out dividends amounting in the aggregate to 696.9 per cent, whilst the latter over an 18-year period totalled 827.5 per cent, or about 46 per cent per annum. The capitalization of the companies is respectively F. 2,500,000 and F. 1,500,000. The Simau company is still paying well and has substantial ore reserves, but Redjang Lebong would appear to be approaching the end of a useful life.

The expedition, which started off from Tandjoeng Redeb on July 6 last, has an arduous task before it and one which will test the skill and stamina of all concerned. The veritable armada of native praus (12 in number), carrying the kit and personnel of the expedition, will meet many obstacles in the upper reaches of the Kelai River, in the shape of rapids, shallows, and windfalls of timber. The terrain which is the objective of the party is inhabited only by nomadic Poenans and Sagai and is covered by heavy jungle, where the rhinoceros, python, wild pig, deer and lemboe (a species of wild cattle) hold high carnival. The area held under prospecting licence is enormous, approximating some 200,000 acres, and years

must elapse before any clear opinion as to its mineral value can be arrived at. In the event of this new field proving to be commercially exploitable and extensive there will undoubtedly be an opportunity for capital investment to deal with its resources. There is presumptive evidence of the possible existence of a great mineralized auriferous belt in the high plateau of Central Borneo.

Reference to a map of Borneo shows that all the principal rivers throughout that part of the vast island continent owned by Holland take their origin in a great central plateau and flow therefrom, east, west and south, to the sea. On the west is the Kapoeas River, discharging into the Java Sea, some miles below Pontianak. On the south is the Doesoen or Barito River, discharging into the Java Sea through a huge delta, on an eastern arm of which stands the town of Bandjermassin. On the east coast are the Mahakam, Kelai, Segah, and Kajan rivers. On the upper tributaries of all these streams alluvial gold is found in greater or lesser quantities, notably on the Melawi River, an important tributary of the Kapoeas, on the west; on the Lahei River, a tributary of the Barito; on the Marah River, a sub-tributary of the Mahakam, on the east, and on several of the upper tributaries of the Kelai and Segah rivers, also on the eastern seaboard. Of the Kajan River, in the native State of Boeloengan, the writer has no first-hand knowledge and can only speak from hearsay, but native reports indicate alluvial gold in this area also. All the rivers mentioned originate in the great central plateau which forms the back-bone of this island continent and it is a logical assumption that the auriferous belt which has provided the enrichment of all these great rivers has its origin in this plateau. Owing to the dense vegetation which clothes the island of Borneo denudation and disintegration should have been correspondingly retarded and the chances of finding the mineralized veins *in situ* are all the stronger.

If the present expedition, now on its way to this prospective El Dorado, should be successful in proving the correctness of the foregoing deduction the time may not be so far distant when the continuous roar of the stamp-mill and the reverberation of the dynamite blast will awaken the echoes and scare away the game from what is to-day only a primeval wilderness of jungle and torrent.

Growth of Shanghai Industry

AMONG the important items used in determining business indices for any particular community is the kilowatt hour sales of electrical energy in that community.

In practice it has been found that to manufacture a certain volume of goods in an industry a certain number of kilowatt hours of electrical energy are required. It follows that if the volume of electrical energy increases then the volume of goods produced has reasonably increased in proportion to the increase in use of electrical energy and it is therefore a fair index to industrial activity and to the volume of goods produced.

As electrical energy is used for lighting shops, homes, apartments and other large buildings the growth of the total sales of electrical energy show the general trend of the community's growth or prosperity.

With this in mind it is of interest to study the records of the Shanghai Power Company which serves the International Settlement of Shanghai.

Steady General Growth

Table No. 1 shows the growth of electrical consuming devices connected to the company's service (a steady rise to over 300,000 kilowatts of load in 1934 from almost nil in 1901, 50,000 in 1919, 200,000 in 1928). This table brings out the continued uninterrupted growth of current consuming devices of all kinds and shows that the growth is steadily continuing.

This table serves as a guide to the actual expansion of the city as a whole.

Table No. 2 shows the total kilowatt hours used each year. This table shows a steady increased growth of business as a whole including, besides industries, large buildings of all description and residences (from almost nil in 1901 to 100,000,000 in 1919 to 500,000,000 in 1928 to over 700,000,000 in 1934). This table is not only an indication of the growth of Shanghai as a whole but also takes into consideration the volume of business being done. It also brings out the fact that after each disturbance industry has in the past immediately recovered to an increased volume of business and resumed its natural increase in growth. In the years of 1925, 1927 and 1932 there were disturbances in Shanghai and the volume of industrial activity decreased for those years. It would be noted, however, that in the following year industry recovered to approximately what might have been expected had there been no disturbance. It is a remarkable illustration of the recuperative

power of the community and its ability to overcome adverse factors.

Industrial Activity

Curves in Table No. 3 show a comparison of kilowatt hour sales to large industries only for the years 1931 to October 1934 inclusive and convey a fair conception of the present industrial activity in Shanghai. It will be noted that except for the months of February and March, 1934, the industrial activity is higher than in the preceding years and is continuing at this date to show that the volume of industrial activity is higher than in any of the preceding years.

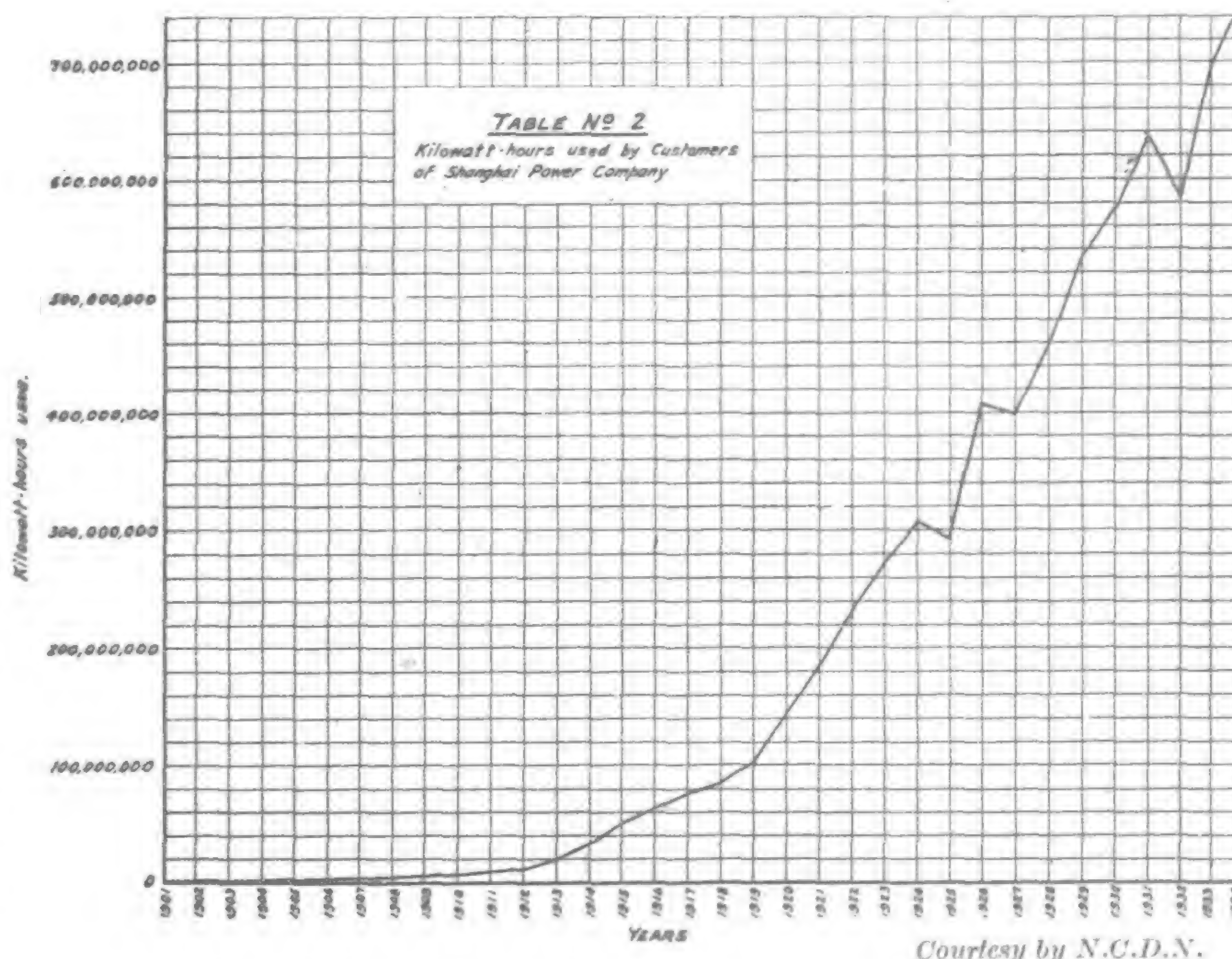
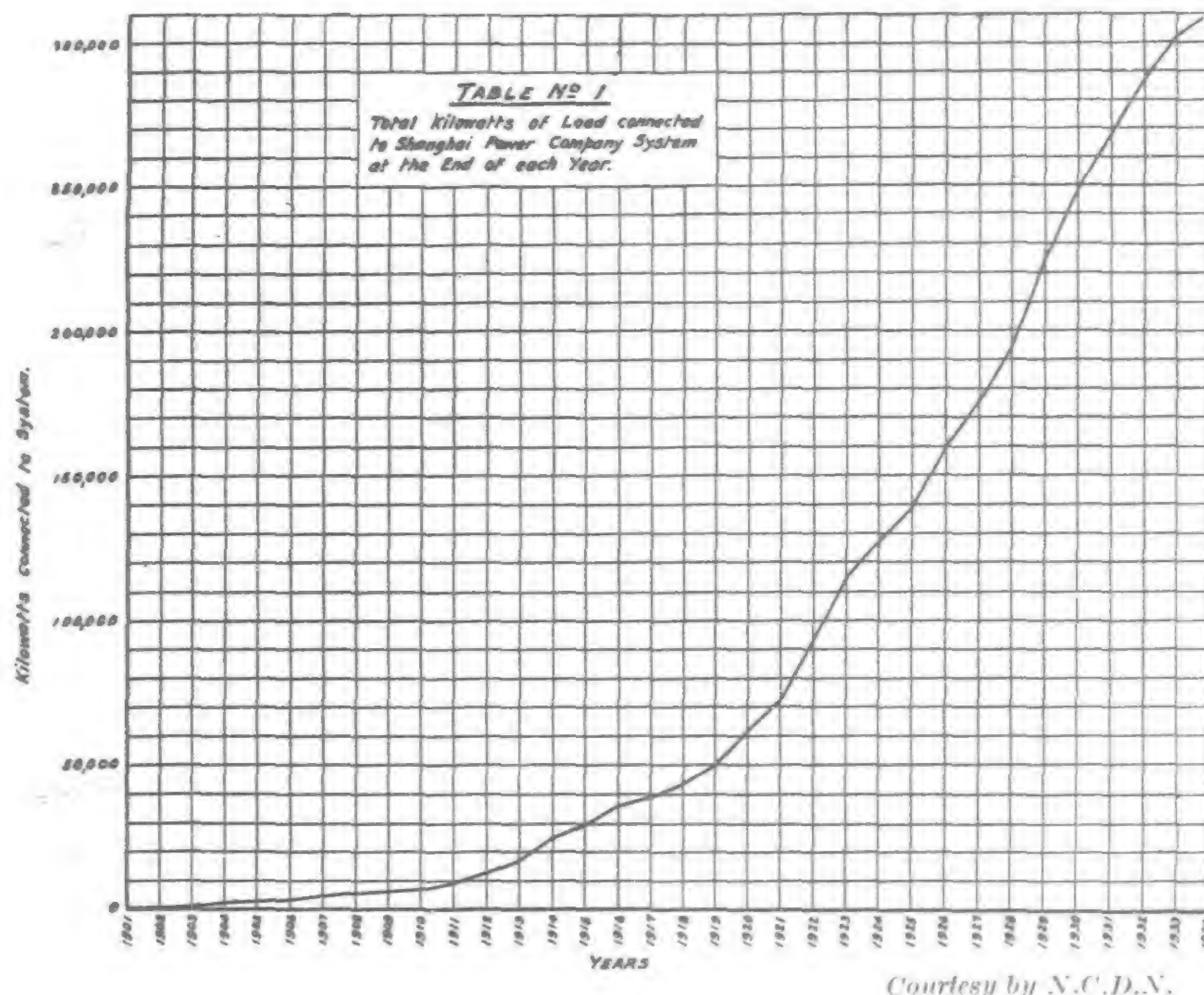
These curves illustrate also how accurately they portray industrial activity as it will be noted that in the years 1931, 1933 and 1934 there is a drop in February caused by the China New Year holiday during which time industries shut down. The deep dip in the 1932 curve was caused by the Sino-Japanese difficulties at that time. It is also noteworthy that in 1934 the drop in industrial activities for the China New Year was greater than in the previous years and did not return to normal as rapidly as before. This corresponds with the resumption of more universal and longer celebration of China New Year in 1934. These particular points are noted to

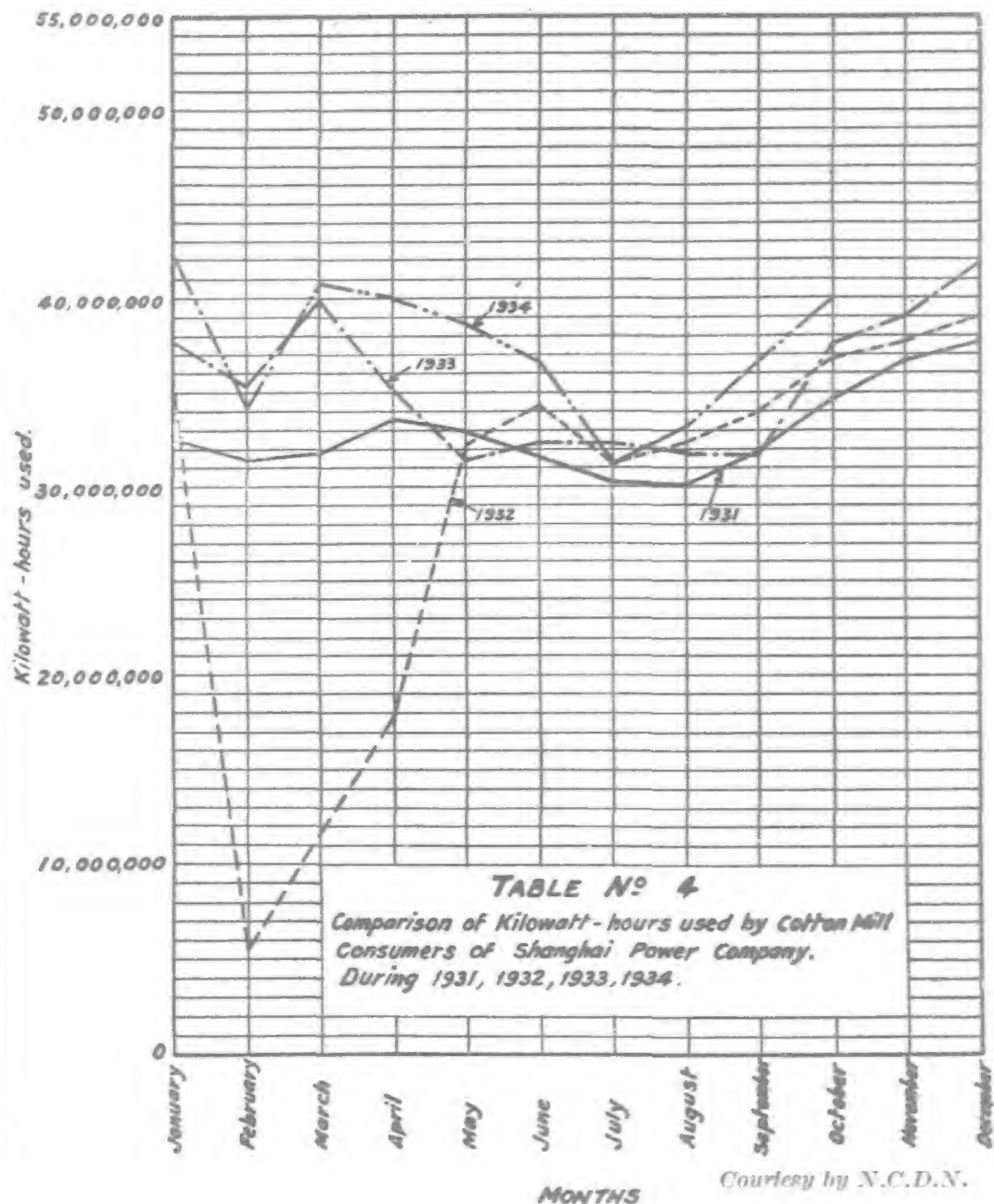
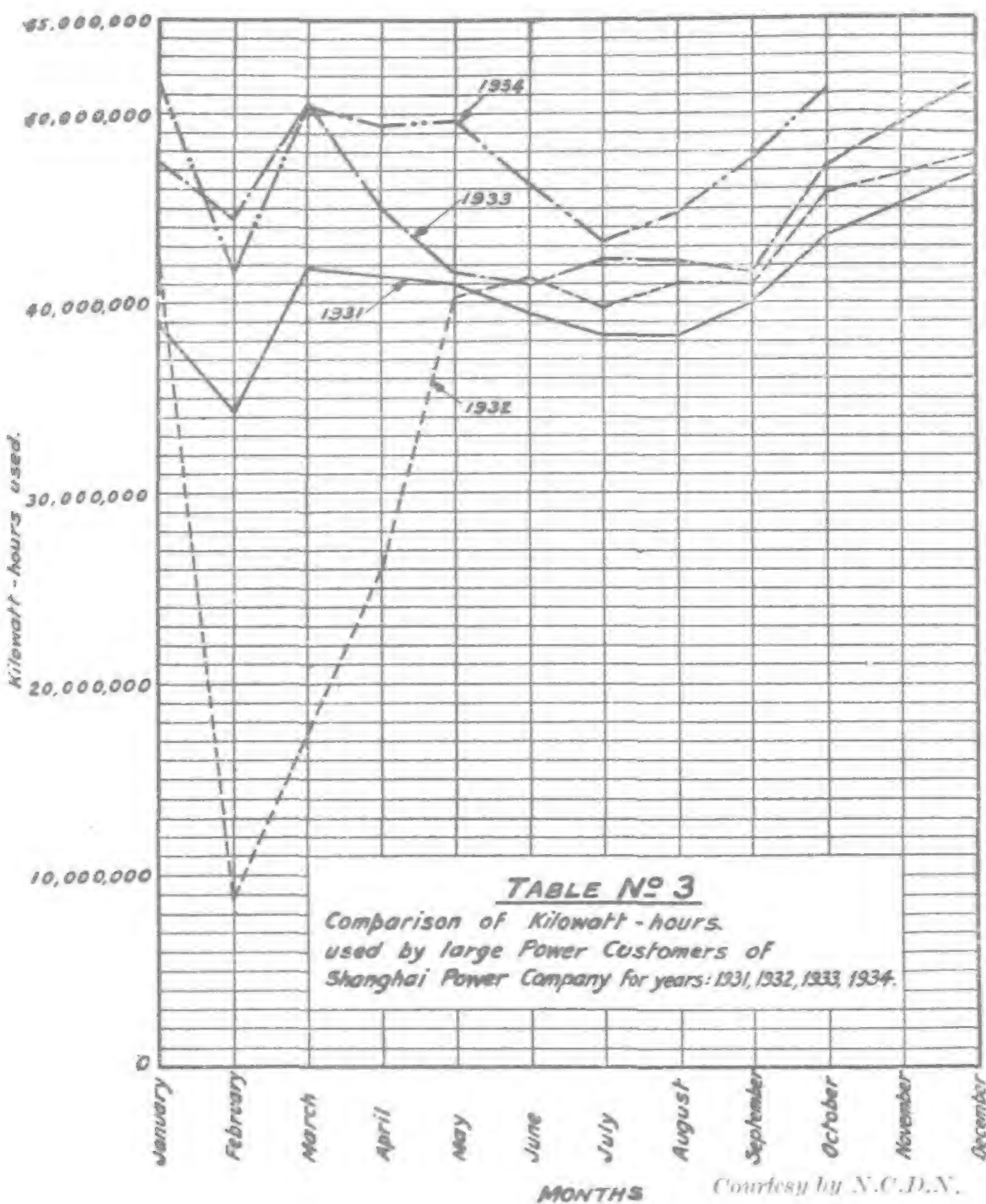
bring out the fact that the kilowatt hour sales are an extremely accurate and sensitive indicator of the volume of industrial production.

Cotton Mill Indices

As there is a great deal of interest in the activities of the cotton mills it is interesting to examine the kilowatt hour sales to that industry as shown in Table No. 4. This clearly demonstrates that except for the month of February, 1934, and a temporary reduction in July, 1934, the volume of industrial activity during 1934 to date is ahead of anything experienced in the past. The curves demonstrate the curtailment of production in 1933 which took place in May and continued until September after which production returned to normal and showed an increase over the previous years.

The examination of kilowatt hour sales to other industries shows clearly the activities of the particular industry. Flour mills during the early part of 1934 show a considerable reduction in production but since May have been running at the same general average maintained in 1933 and in most instances higher than in the previous years.





Continuing to Grow

The general conclusion can be reached from this data that Shanghai in 1934 is continuing to grow. Its volume of industrial production has steadily increased and while the trend is not as rapid as in certain previous years it is substantial and steady. The data of course in no way measures the profitableness of industry but the general conclusion must be reached that industry as a whole must be making profits or the industrial volume of activity would be forced to drop off. While of course there are individual industries and possibly individual classes of industry that have not shown the progress and activity in 1934 that they have in previous years, taking all industry combined there can be no doubt that business is continuing to make progress.

Because of the large diversified service of the Power Company to all varieties of industries, the kilowatt hours sales Table No. 2 give a true picture of the industrial activity in Shanghai as a whole. This large diversity of service greatly stabilizes the business of the Power Company and eliminates the extreme fluctuations in business often experienced in industries of one class of business.

China's Oil Deposits

The Chinese Central Government in Nanking has drawn up a Four Year Plan for the opening up of the substantial Chinese crude oil resources.

At present China is importing annually about \$1,000,000,000 of oil and oil products, and it is anticipated that the demand for oil will soon rise sharply in connection with the industrialization of China, and particularly the construction of a net of motor roads.

Oil resources of the province of Szechuen have been known for centuries, and recent drilling has shown that, apart from this province, there are rich oilfields in the provinces of Jehol, Niaming, South-Hunan, Kwantung, Kwansi, and Kweichow.

Prospecting work carried out by the National Chi-Nan University has verified the existence of good oil deposits in the West of Kansu.

For the time being the Government intends only to exploit the Szechuen fields near Tsuliatsing, North-East of Foochun, which, being near the Yangtze, have the most favorable situation as regards transport and communication.

The extent of the Chinese oil reserves are shown by the report of an American geological commission, which recently investigated the oil fields of Shensi.

American experts report that the deposits of Yenchang alone are large enough to provide for the oil consumption of the whole world for a period of three years. Up till now, 30 highly productive wells have been opened in Shensi.

The Four-Year Plan of the Government provides for the construction of modern roads, railway lines, and pipe lines for the transport of the oil.

Total expenditure for the carrying out of this program, including expenditure for prospecting and drilling, is estimated at \$11,500,000.

It is hoped by the sponsors of the scheme that at the end of the program China's oil output will have risen to 80,000,000 gallons annually, which would amount to about one quarter of the present consumption.—*Financial News*.

Industrial Development in Szechuen*

By K. WAN

SZECHUEN may be described as a land of buried treasures which might have become one of the richest provinces of China had its natural resources been fully exploited. The reasons for the tardy economic development of Szechuen are many, but difficulties of communication and transport may be said to be among the most important. Being mountainous, many parts of the province are not easily accessible, and in addition to these natural obstacles the province has been torn by continuous civil strife. While the former factors have been responsible for retarding economic development, the latter have prevented the healthy growth of industries in Szechuen.

During the past year efforts have been made to accelerate the industrial development of the province, which has been visited by Government officials, bankers, engineers and economists, with the object of studying conditions and prospects of establishing modern industries and developing the field for investment in the province. A Szechuen Reconstruction Commission has been formed, entrusted with the power of directing the general economic development of the province, while organizations for the improvement of Szechuen products have been established. Plans have been drafted to this end and work in some directions has been started, but this article will deal only with the actual conditions prevailing.

In describing the industries of Szechuen, it is convenient to group them into handicrafts and machine-made manufactures. As in other provinces, handicrafts are more general and more important, large-scale manufacturing industry being only in its infancy. During the last few years a marked decline has been seen in handicrafts, notably in silk-weaving, paper, sugar and other industries, because of inability to compete with imported goods sold at very low prices. Modern manufacturing industry, however, is showing signs of progress, in spite of its recent origin, as raw materials are abundant while labor is cheap.

In regard to agriculture, there are over 165 million *mou* of arable land in Szechuen, of which about 34 per cent is paddy field, 24 per cent is devoted to wheat, 10 per cent to maize, and the remainder to soya-beans, rape, potatoes, kaoliang, etc. The favorable climate makes it possible to reap three crops a year. Rice is a very important crop, production each year amounting to 132,452,000 piculs of non-glutinous and 12,900,000 piculs of glutinous rice, Szechuen ranking second among the rice-producing provinces of China. Besides staple agricultural products, other produce such as timber and livestock are shipped to other provinces to the value of about 50 million dollars a year.

Mineral deposits in Szechuen are rich, especially gold and copper, and salt is produced to the value of over 50 million dollars yearly. Oil has been found in many places, but has not been tapped on a large scale.

Handicraft Industries

Silk-weaving.—Szechuen is one of the most important silk-producing provinces in China, and the annual production often amounts to 40,000 piculs, mostly yellow silk. The cities of Chungking, Chengtu, Shunching, Loshan and Tungchuan are the chief producing centers, from which points the annual export of silk is valued at over 13 million dollars annually. During the last few years, however, the industry has suffered greatly, due to the keen competition of Japanese silk in foreign markets and to the increased import of rayon into China. In addition, the antiquated methods of rearing worms and reeling silk keep the quality of the Szechuen product at the same level as that reached decades ago. Almost every farmer who rears silkworms suffers losses, while silk mills are either operating at a loss or have suspended operations entirely, production having been curtailed by 75 per cent. Relief measures have been adopted by the provincial authorities, but little improvement has been achieved yet. The famous Szechuen satin and brocade, produced chiefly in Chengtu and Chungking, were exported to the value of only about a million dollars, whereas during

good years the value of these fabrics exported often reached eight or nine million dollars.

Paper.—Over twenty *hsien* in Szechuen produce paper of various descriptions, ranging from the finest fancy letter-paper to coarse wrapping paper. The mills are many in number but are operated on a small scale and by crude methods. Raw materials are abundant, including wood, bamboo, bark, rice-stems, weeds, waste jute, etc. This handicraft industry was formerly very flourishing, its products being supplied to many parts of the country, with a large quantity exported to the South Seas. Like many other industries, paper-making in this province has been greatly affected by the importation of foreign goods, of which the value reaches two or three million dollars a year. Many mills have suspended operation.

Sugar.—Cane is abundant in the districts of Tsuchung and Neichiang, and consequently sugar-making is an industry of considerable importance in those regions. The method of manufacture is simple and crude. The cane is first crushed between iron cylinders to extract the juice to which a small quantity of lime is added to precipitate impurities. When these are drained off, the liquid is boiled in an iron cauldron, and when it thickens to a certain degree is poured into earthenware vessels and left to cool. The sugar in this syrup crystallizes after cooling, and the water content is extracted by applying dry earth. The sugar thus obtained is dark brown in color and very impure in quality. From 100 piculs of good cane about 15 or 16 piculs of sugar are obtained. Formerly, the annual sugar exports from these districts amounted to about \$4,000,000 in value, but in recent years a downward trend has been seen on account of the keen competition of imported sugar. In Hsichang and several other places cane is cultivated, but the sugar output is very small.

Tea.—About 70 districts in the province grow tea, the total area under tea cultivation amounting to about 300,000 *mou*. Nearly 29,000 families are engaged in the growing and preparation of tea, the annual output, including all varieties, amounting to 80,000 piculs. A portion of this is exported to Tibet and frontier regions, but the bulk is consumed locally.

Wines and Spirits.—Kaoliang, corn and wheat are all crops used for making wines and spirits. The wine produced in Jungchang, Lungchang, Luhsien and Wanhsien is famous in the province, while Chienwei is noted for its *samshu* of which two kinds are produced, *ta cha* and *hsiao cha*, the former being made from kaoliang and the latter from corn. That made from kaoliang is considered superior, as it does not cause a thirst after drinking.

Grass-cloth.—Ramie is grown in a number of districts, and a considerable quantity of grass-cloth is produced at Chiangtsin, Lungchang, Jungchang and Neichiang. The value of annual shipments to other parts of the country amounts to about \$4,000,000.

Glass and Porcelain.—The glass industry is an enterprise of recent origin in this province, but although some scientific methods have been introduced, the processes of manufacture are mostly manual, little machinery being employed. There are 16 such glass-works in the district of Chienwei alone, with capital ranging from \$5,000 to \$20,000, their output consisting principally of window-glass from four inches to two feet in size, wine bottles, sugar containers, medicine and toilet bottles, and lampshades. The Li Hua Glass Manufacturing Company, of Chiangpei is operated on a co-operative basis, all workers in the factory being shareholders of the concern. It started with a capital of only \$7,000, but has grown considerably during recent years, and its annual output amounts to over \$20,000.

Kaolin is abundant in Szechuen, and there are quite a number of porcelain manufacturers. The Tsu Lu factory of Penghsien, with a capital of \$100,000, is a very prosperous concern and turns out an excellent quality of goods. The products of the porcelain manufacturers in Lungchang and Jungchang are as good as those of Ihsing, Kiangsu. The Shu Tsu Company of Chungking

*The Chinese Economic Journal.

specializes in the manufacture of teacups, teapots, and flower-vases, the annual output amounts to more than \$20,000 in value.

Minor Industries.—The pickled vegetables of Szechuen are famous throughout the country, and the quantity exported is quite considerable. Brassware, and bamboo and rattan furniture made in the province are good in quality and low in price. These industries, though small in scale, are worthy of attention, as they are capable of great expansion.

Mining Activities

There are many mines in the province, mostly operated in a primitive way. The more important undertakings are as follows:—

Coal.—The coal deposits of Szechuen are estimated at 9,864,000,000 tons, practically all of which is bituminous, but the annual output is insignificant. The Shuichuan and Paoyuan collieries at Hsiachikou, Pishan produce daily from 100 to 200 tons of coal, while the Kuankou colliery at Ta-i has a daily output of about 150 tons. A number of small collieries are planning an amalgamation with a view to producing a total daily output of 500 tons, but the scheme is still in its preparatory stage.

Copper.—Szechuen is rich in copper, deposits having been located at Masungling of Penghsien, Chienchupa and Chinchuling of Jungching, Pichishan, Yuehchin, Shantsaitung, Hsiakuan of Tienchuan, and many other mountainous regions, but very few of these are being worked. The deposit in Penghsien is perhaps the richest in the province, and though containing only two or three per cent of copper, yields about six per cent of nickel, according to an assay made by the Szechuen Central Industrial Institute. The Penghsien mine is the only one in the province worked in accordance with modern methods.

Iron.—Deposits have been found in Chienchang Tienchuan, Tachu, Wanhsien, Wei yuan, Kuanhsien, Penghsien, Yungching, Junghsien, Nanchuan and Chichiang. Although these deposits are widely distributed, they are found only in thin strata, and most of the mines are worked in a primitive way. The total annual output amounts to only about 60,000 tons of ore and 20,000 tons of pig-iron. The mines at Yungching, Wei yuan, and Chichiang are operated on comparatively modern lines.

Salt.—Salt is a special product of Szechuen, the number of brine-wells in the province being about 8,800. At Tsuliutsing and Kungtsing, natural gases are used to boil the brine, and the annual salt output of these two places amounts to 3,000,000 piculs. The wells are of two varieties, yielding yellow and black brine. Yellow brine is tapped at a depth of about 1,500 feet and contains 10 per cent of salt, while black brine lies at a much greater depth, usually about 3,000 feet from the surface, and contains from 20 to 25 per cent of salt. Wells are sunk by means of heavy iron-borers worked by oxen, and it takes from two to three years to sink a single well. Brine is brought to the surface in a bamboo vessel, fitted with a valve, which is attached to a long rope and lowered into the well. The brine thus brought to the surface is poured into a large container and fed to iron cauldrons through bamboo pipes to be boiled, the salt being obtained by evaporation. The many by-products found are not utilized. The boring of gas and oil wells is carried out on similar lines to a brine well.

Gold.—Deposits in Szechuen are mostly found in the western part of the province and Sikang, in the Minchiang, Tachin Ho and Hsiao-chin Ho valleys. Gold is found in veins of quartz, ranging from a few inches to about a foot in thickness. Most of the gold now produced, however, is alluvial gold, found in the form of nuggets and dust in the beds of streams. These deposits are much richer than the quartz veins. The annual output of Szechuen and Sikang amounts to about 16,000 liang.

Petroleum.—Though several investigations, conducted by Chinese as well as foreign experts, have been made concerning petroleum deposits in Szechuen, no definite figures are available. Judging from the richness of natural gas in regions like Tsuliutsing and Kungtsing, the petroleum deposits probably lie below the gas belt, from three to four thousand feet from the surface. Petroleum is found in a number of wells in the above-mentioned regions, in the form of scum floating on the surface of the brine, and from each well from a few hundred to several thousand cabbies of petroleum are obtainable, but the total output amounts to only 50 tons a year. Probably deep drilling with up-to-date machinery is necessary to obtain petroleum in any quantity.

Modern Industrial Enterprises

Chungking Power Plant.—This enterprise was formed by an amalgamation of the Chuchuan and Ichi plants. It is equipped with two generators, having a total capacity of 300 horse-power. The capital of this concern has been increased to \$1,800,000 with a view to building a new power station at Tahsikou, where two turbine generators, with a total capacity of 2,000 horse-power, will be installed. It is expected that the new plant will supply power to the local mint, the arsenal, the waterworks, and several factories during the day, and light 100,000 lamps at night.

Chungking Water Company.—This undertaking was established in 1931 by the local Government and merchants, with a capital of \$3,000,000. The pumping station is equipped with a steam-engine of 600 horse-power, and two electric pumps having a capacity of 400 tons per hour. At the filter-beds there is an electric pump with a capacity of 150 tons per hour, and several reservoirs for filtering and storing water. The total capacity of the reservoirs amounts to about 20,000 tons. Customers are charged for the consumption of water according to meter readings at a rate of about 20 cents per ton.

Min-Sheng Machine Shop, Chungking.—Situated at Tsing-tsaopa this department of the Min Sheng Steamboat Company is well equipped with machinery and tools for various kinds of repair-work. The owners are planning an extension of the plant in order to make steam and gas engines.

Textile Mills.—The Hua Chuan Woollen Mill and Hsi Hua Cotton Weaving Mill, Chengtu, the Hua Hsin and Lung Hsing Silk Filatures, Chiating and the San Chia Dyeing and Weaving Factory, Peipai are textile factories operating with modern equipments.

Paper.—The Chia Lo Mill, Loshan, was established by local merchants with a capital of \$100,000, and is equipped with two steam engines capable of producing a total of 200 horse-power. The principal raw material used is rice straw, amounting to about 70 per cent of the total, but bamboo and ramie are also used. The paper produced is 44 inches wide, and although not so attractive in appearance as the imported article, is good enough for ordinary purposes, and is extensively used by printers in Chengtu. The mill produces two varieties of paper, gray and bleached, and the total output last year amounted to 4,700,000 sheets.

Soda.—The Chiayu Soda Factory, Loshan, produces soda ash and caustic soda indispensable to a number of industries, including paper, glass, dyeing, weaving, and mining. Formerly, the demand for soda in Szechuen was almost entirely supplied by a British firm, Imperial Chemical Industries (China), but with the discovery of saltpetre in Penghsien, the Chiayu Soda Factory was formed, supplying the needs of paper-mills at Chiachiang, Hungya and Chiating. No imported soda is now used west of Chungking. The factory is an enterprise started by local merchants and is under Government supervision, having a daily output about 30 piculs of soda ash and sodium carbonate, valued at about \$300, and also supplies current for lighting nearly 2,000 lamps.

Mining.—The Peishuiho Copper Mine Penghsien, worked by old-style methods until the first decade of this century, when modern machinery was installed, but operations have been suspended since 1916.

Electric-Works.—The hydro-electric plant at Luhsien, was established by local merchants with a capital of \$216,000. The equipment includes three transformers, an A.C. generator capable of producing 140 kilowatts, and a turbine of 320 horse-power. The monthly profit amounts to about \$4,000.

The Min Sheng hydro-electric plant at Hochuan is equipped with a generator capable of producing 80 kilowatts, and in addition to lighting about 4,000 lamps supplies power for pumps and rice-grinding machines.

The Chi Ming plant at Chengtu is another new enterprise, utilizing the river current to generate power, but during the dry season, a Diesel engine has to be used.

Cement.—The Pu Li factory at Chiangpei, was established by Messrs. Wang Chao Kui, Chi Wen Lan and others, but on account of insufficient capital, operations were suspended until the concern was reorganized this year. The factory now maintains a monthly output of 500 barrels, and the owners are planning to increase the capital to \$600,000 and install additional machinery to increase the daily output to 200 barrels.

Organs.—The Chungking Organ Factory is a branch of the Hsieh Ching Cheng Organ Factory of Shanghai. The instruments

produced are sold at prices ranging from \$30 to \$500, Szechuen and Kuichow being the principal markets. Last year about 300 organs were sold, most of them of the \$50 variety.

Projected Enterprises

Chungking Steel Works.—A committee has been formed to plan the building of this works, with Mr. Yang Fang Yu as chairman. The plant will include a three ton electric furnace, two steam turbines, two 500 kilowatt A.C. generators, testing machines, and accessories, costing in all over \$100,000 gold; this plant has been already purchased, but it is planned to complete the equipment by further purchases from abroad. The principal product of the factory will be steel, but castings and machine parts will be also supplied to order.

Weiyuan Iron Works.—This factory was established by the 24th Army with a capital of \$300,000 and is equipped with a 10 ton blast furnace; the boiler-room, bellows-room, brickyard, store-room, laboratory and foundry were nearly completed. Much damage was done to this factory during recent civil strife, and it is planned to spend about half a million dollars on completing the work. The site at Lienchiehchang, near which place rich deposits of coal and iron have been discovered. There is a steelworks bearing the same name at a place 40 li from Lienchehchang, but it is not in operation at present.

Chengyu Silk Weaving Factory and Shuining Cotton Mill.—As already noted, the silk industry of Szechuen is suffering severe depression, but of cotton and cotton goods, the province has long felt a scarcity. The population of Szechuen is about 70 millions, and at 6½ catties per capita per annum, the annual consumption of cotton in the province will amount to about 3,500,000 piculs. The total raw cotton production of the province, however, is only about half a million piculs, and during the last few years the value of raw cotton, cotton yarn, and cotton piece-goods imported amounted to from \$40,000,000 to \$60,000,000 annually, exceeding the value of the total exports of the province. Consequently, cotton cultivation and the establishment of textile mills are matters of the utmost urgency in Szechuen. Furthermore, the province is

rich in silk, ramie and wool, so that the establishment of textile mills will provide an outlet for these products. The Production and Reconstruction Conference held this year consequently decided to establish these two factories, and preparatory steps have been taken for their operation.

Chintang Hydro-Electric Plant.—The site of this plant is at Yuhungchiao, outside the city of Chintang, the object being to irrigate the surrounding rice-fields. If the scheme is successful, the plant will generate enough power for the irrigation of 23,000 mou of rice-fields and at the same time solve the problem of power-supply in Chengtu. The planning of this plant is to be determined by the Provincial Reconstruction Committee, while the management will be entrusted to the National Economic Council. A sum of \$100,000 has been allotted for carrying out the preliminaries of this scheme. Similar proposals have been made in regard to power generation by utilizing water resources at Kuanhsien, Fengtu, Kaokeng, and Sikang. It is estimated that the rapids and falls in the province are capable of producing twenty million horse-power if fully utilized.

Kai Yuan Sugar Refinery.—This factory is to be established by Mr. Lan Tien Yu and other merchants. Experts have been engaged to study methods of refining the native brown sugar into white sugar, and considerable success has been achieved in this direction.

Peiling Paper Mill.—The district of Peiling possesses a rich timber supply, the annual output being valued at more than \$100,000. A group of local merchants are planning to establish a mill for the manufacture of wood pulp and paper.

Peipei Cement Works.—A cement works is to be established at Peipei with a capital of \$1,500,000. Mr. Lu Tso Fu, general manager of the Min Sheng Company, is one of the promoters of this project.

At the Production and Reconstruction Conference, held in May last year, it was decided to start a number of industrial enterprises in the province. The large-scale projects will be under control of the Provincial Reconstruction Committee, while the less important ones will be supervised by the Szechuen Provincial Committee for the Improvement of Local products.

Railways in Manchuria

Year-end computations of railway construction in Manchuria reveal the stupendous mileage accomplished by the combined systems of the State.

In two years nearly 2,000 miles of new railway have been built under conditions of enormous difficulty. Battling bandits, and two floods unequalled in modern memory, the South Manchuria Railway and the General Direction of State Railways produced nine different railway lines, complete with equipment, stations, personnel.

A railway review in the records of the S.M.R. show that before the Mukden Incident the total length of all railways was 3,715 miles. The present admitted mileage, fully completed and in operation is 4,644. But there has to be added 1,021 miles of railway under construction; these are known to be actually completed, although not rated as such in the conservative figures of the managements. Thus the combined figures give 5,665 miles. When the 1931 mileage is deducted from the sum to-day the difference is 1,956.

Building Against Odds

Actual construction did not start until the spring of 1932. In the summer and autumn the first great flood swept the north against which railway workers provided an epic struggle. This year a similar disaster was recorded, but the engineers kept grimly on, building right-of-way, laying tracks where they could, tunnelling and throwing bridges.

The new lines give access to all fronts of Manchuria for defense purposes and tap the economic riches of the nation in former wildernesses.

The railway lines before the Manchurian Incident were as follows, all figures being in Kilometers as the national records are kept in metric:

S.M.R. Lines

Dairen-Hsinking 702 kilometers; Mukden-Antung 261; Branch lines 145; Total 1,108.

N.M.R. Lines

Southern 240; Eastern 546; Western 935; Total 1,721.

Other Lines

Fengtien-Shanhaikwan, 420; Tahushan-Tungliao, 249; Hulan-Hailun, 213; Tsitsihar-Koshan, 163; Kirin-Heilungcheng, 183; Mukden-Heilungcheng, 253; Tungliao-Chengchiatun, 114; Ssu-ping-kai-Taonan, 323; Taonan-Angangchi, 224; Kirin-Changchun, 128; Kirin-Tunhua, 210; Peipiao line, 113; Chinchou-Pitzuwo, 102; Light Railway, 347; Grand Total 5,943.

The new railway lines constructed in 1933 were as follows according to order of completion.

Harbin-Lafa, 291 kilometers; Tunhua-Tumen, 192; Hailun-Koshan, 192; Laha-Noho, 139; Taonan-Hwayuanchen, 94; Total, 838.

New and Being Built

The new line constructed in 1934 were as follows:

Koupeiyingtzu-Lingyuan, 157 kilometers; Chaoyangchuan-Kailzanton, 59; Tumen-Ningta, 252; Tapanshan-Lingyuan, 157; Peianchen-Heiho, 303; Solun-Hwayuanchen, 114.

The lines are under construction are as follows:

Ningta-Chiamussu, 317 kilometers; Linkou-Mishan, 183; Lingyuan-Chengte (Jehol), 189; Solun-Halunarshan, 153; Ssu-ping-kai-Hsian, 148 (under survey); Taonan-Tailai, 120; Hsinking-Tailai, 213; Other line, 146.

China's Silent Service*

Hydrographic Department Beginnings Outlined

A TASK of amazing interest to the commercial and shipping communities of China is being daily carried out by the Hydrographic Department of the Chinese Navy—"China's Silent Service." Twenty-four hours of the day for 365 days each year, some members of this department are plotting out the positions of the many different and changing shoals along the China coast, making for the first time an accurate and scientific geodetic survey of the coast, and preparing warnings to shipping of the hitherto unknown dangers they have discovered.

The department has been in existence for just over fourteen years, and it has not yet had time or the funds to make a complete geodetic survey of the longest national coastline in the world. Even to-day there are sections of the seas surrounding China that are almost unknown to foreign shippers. Many sand-banks and rocks are uncharted. There is no safe sea-road through them, though reconnaissance efforts have been made by different navies to point out their principal features.

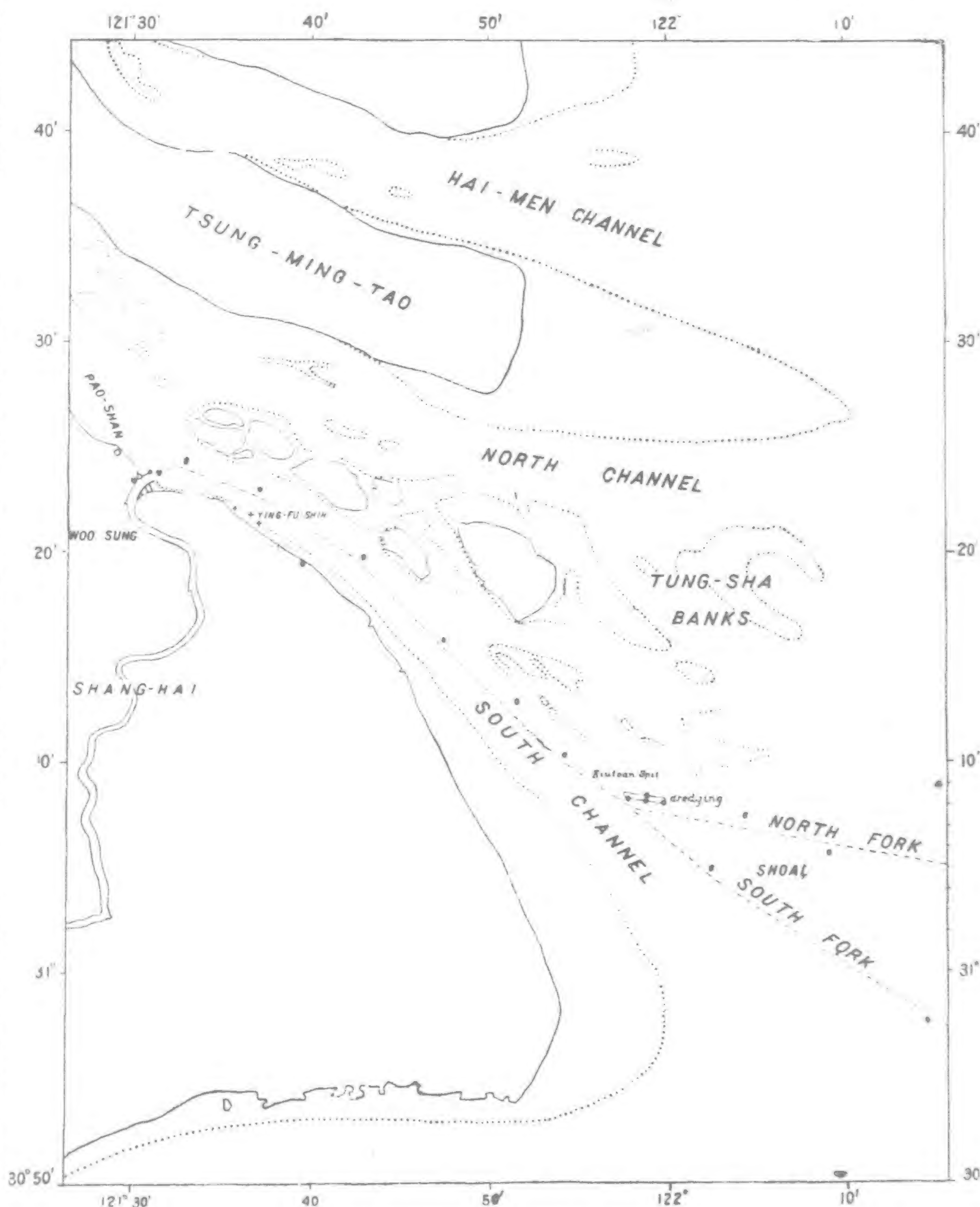
Former Surveys

Up to 1904 the survey of the marginal seas and treaty ports was principally undertaken by the British and other navies. From 1904 to 1922, during which period the commerce and shipping of the China seas and coast leaped ahead, the surveys of the treaty ports were done mostly by the Customs and various conservancy organizations. This proved, however, to be a makeshift policy, inadequate to shipping requirements. The surveys thus made were often amateurish in kind, local in nature, costly in effect, and unadaptable in the world's hydrographic circles owing to the absence of geodetic control and sequence. When, after the war, there was a great development in China's maritime provinces and in China's trade in general, there was a clamour for hydrographic service.

In 1922 Government legislation inaugurated the Hydrographic Department of the Navy. The new department immediately took up the Government's responsibilities for state membership of the International Hydrographic Bureau and organized its new service. Numerous naval officers were sent abroad to Europe, America, and Japan to be trained in the science of hydrography, geodesy, the tides, and magnetic survey. Several were also trained as aviators and air photographers.

Steady Progress

The great need for a hydrographic service in China has ensured the steady progress of the new department, and to-day it is a highly efficient service, closely related to all technical departments of the Chinese Government and the hydrographic departments of foreign governments. Its membership of the International Hydrographic Bureau has given it certain privileges and corresponding responsibilities. To meet them it has so far produced 60 charts and various technical publications such as tide tables, notices to mariners—of which 300,000 were distributed last year—and lists of lights, buoys, and beacons. It is also engaged in compiling sailing directions and directions for port facilities and all other



The Entrance to the Yangtze River

*The North-China Daily News

such marine publications that are required of it in its state membership of the International Bureau.

It had had a very difficult beginning, as it found the coasts and rivers of China and the marginal seas practically without any geodetic control or system of hydrographic research. The hydrography of China such as existed was principally in the archives of foreign governments, and much of it dated back to the 19th century and was totally inadequate for the modernized China of the post-war period. The records kept by pioneers—mostly derived from the Customs—were crude and almost unadaptable to modern practice.

Sound Foundation

A sound foundation had, therefore, to be laid for the new department. All the fundamental factors of the geodesy of China had to be established and systems and standard values laid down. Standard meridians and parallels had to be fixed for the charting of the coast and rivers.

This entails an enormous amount of work, which is being accomplished steadily and soundly. It is work that cannot be rushed. What is done now must be done with precision, fully and thoroughly, so that the Government will not be required to repeat processes in the future.

Like all hydrographic services of the world, the activities of the service in China are limited by the funds allotted to it by the Government. And in the opinion of many of those interested in maritime trade it would well repay the Government to increase the activities of the department so that the entire coastline can be charted and resurveyed within a few years. It would probably take ten years, but once the charting had been done, the upkeep of the service would be only a small drain on the Government's resources.

Shanghai owes its continued existence as a port for large steamers to the work of the Hydrographic Department of the Chinese Navy, to its excellent pilots; and to the Whangpoo Conservancy Board; and, of course, to the Coastal Inspectorate of the Maritime Customs.

The estuary of the Yangtze is ceaselessly changing. About a year ago officials of the Hydrographic Department walked dryshod over sandbanks that are now submerged and, if the scouring of the tides continues, may lie under the next deep channel to Woosung. The old South Channel is now mostly mudflats at low tide. Islands which a few years ago were some distance up the river, have moved downwards into the estuary, washed away on one side and built up on the other until, looked at over a long period, they seem to be making a crablike journey towards the sea.

Strange Finds Made

In the shifting bed of the estuary many strange finds have been made. A recent one was of the hull of a ship sunk no one knows how long ago, carrying a cargo of ebony. It has been buried under a mudbank. After years of being lost to sight, it gradually reappeared as the scouring of the tides swept the mud elsewhere.

Another is the ancient site of Paoshan City. Piles of masonry, marked on the charts as rocks, now stand as a lonely reminder of a city that watched its defences being eaten away by the encroaching river, until it was forced to transplant itself from Ying Fu Shih, below the junction of the Yangtze and the Whangpoo, to its present site above it.

What the countryside loses to the river in one place it regains as often as not in another. Towards the mouth of the estuary series of dykes show how the people have redeemed mudbanks and turned them into fertile fields. To describe the process briefly—a dyke is built as a safeguard against the river. The river brings mud to the foot of the dyke and leaves it there. When a mudbank of sufficient solidity has been formed, the villagers put up another dyke to enclose it. The river goes on depositing mud at the foot of this new dyke, until another mudbank has been formed. The villagers then take the materials of the first dyke, now well inland, and move them out to build a new dyke to take in the latest mudbank. And so the reclamation of land continues.

Many Adventures

The men of the Hydrographic Department watch and record all these changes. They can tell of strange happenings—of how the inhabitants of Tsungming Island were wiped out in one night of terrific typhoon; how divers descending to examine the remains of some old wreck have sunk in the soft mud of the river bed up to the necks of their diver's helmets and have been extricated only after much labour. They can also tell tales of work during storms off the estuary and of encounters with dangers up and down the coast.

These adventures are, however, only incidental to their main work which is to make the coast safe for shipping. They have charted the Yangtze from the estuary to Hankow, and keep a close watch on all its changes. They were the first to establish the correct distance of Hankow from the river mouth, and found that Hankow was some tens of feet less above sea-level than had been believed. They have also been responsible for correcting the positions of several other ports in this country, shown wrongly on the existing charts.

Points Renamed

In recharting the marginal seas they have also renamed with Chinese names many of the points that have hitherto borne purely arbitrary foreign names. The old names are preserved in small type below the new ones, so that those familiar with them will not be puzzled by the new charts. This has been done with the full approval of the International Hydrographic Bureau. The old names had their uses, but they bore no relation to the coast. It was thought more convenient if native names were adopted. Thus House Island becomes Heng-Sha, Blockhouse Island becomes Ya-Wo-Sha, Grass Island becomes Yuan-Yuan-Sha, and so on.

Another innovation has been the naming of the channels to the north and south of the Tungsha Shoal, the North Fork and the South Fork. The South Fork is the more used by big ships, though the North Fork is the deeper. It was originally proposed to dredge the South from near the Kiutoan Spit light about ten miles towards the Fairway Bell Buoy—a gigantic task. It has now been decided to dredge a channel of about two miles just to the north of the Kiutoan Spit Buoy from the deeper water of the ebb-tide scour in the present channel into the deeper water of the North Fork. When this is done the biggest of ships should be able to come up to Woosung every high tide.

As things are at present, a ship the size of the *Empress of Britain*, drawing 34 feet, can come up only on six days in a month, and then during only four hours of each day, when the tides are exceptionally high. With the new channel it should be possible for her to come up any day of the month, without much difficulty.

Done by Chinese

It should be emphasized that the geodetic survey and the charting is entirely done by Chinese. With a foreign technical expert as adviser, they have formed a most efficient service. It is necessary that the work should be done by Chinese, as during cruises the ships have to live off the country. There is no money for a succession of supply vessels, and it is impossible in view of the time wasted to return to some large port for revictualling when that is needed.

Not only for this reason do the men on the surveying ships find life hard. It is often impossible for them to obtain fresh water without venturing many miles inland and having it carried to the coast in barrels. And in view of the unsettled state of parts of the coast, this is sometimes a hazardous proceeding.

In the circumstances the Chinese can adapt himself to the conditions better than any foreigner, at much less cost. Accuracy in their work is ensured by parties converging from several different quarters upon the same spot. Any miscalculation by one of the parties would be apparent when they met.

The Hydrographic Department of the Chinese Navy is China's "Silent Service." It has developed a wonderful tradition. The individual subordinates himself to the service, and if there is praise being bestowed, the service gets it as a whole.

Chinese Customs Service Craft Combines Speed with Seaworthiness*

It is becoming clear that in the near future—possibly the very near future—fast motor-boats with a high degree of seaworthiness and capable of carrying a heavy load will come into increasing use. This is a development of which the full possibilities are only beginning to be realized, but it needs little imagination to understand how useful boats with speeds of 30-40 m.p.h. and a capacity for loads of eight or ten tons might be for commercial transport services (passengers and goods), and as auxiliaries for naval, military, air and customs services.

Having urged the wider employment of fast motor craft in the Navy for some time past, we were particularly interested in inspecting the latest product of the British Power Boat Co. For the *Kuan Wei*, built specially for the Chinese Maritime Customs to combat the extensive smuggling and piracy in Chinese waters, is obviously capable in the normal course of evolution of proving a useful prototype of a craft of extreme value in naval service.

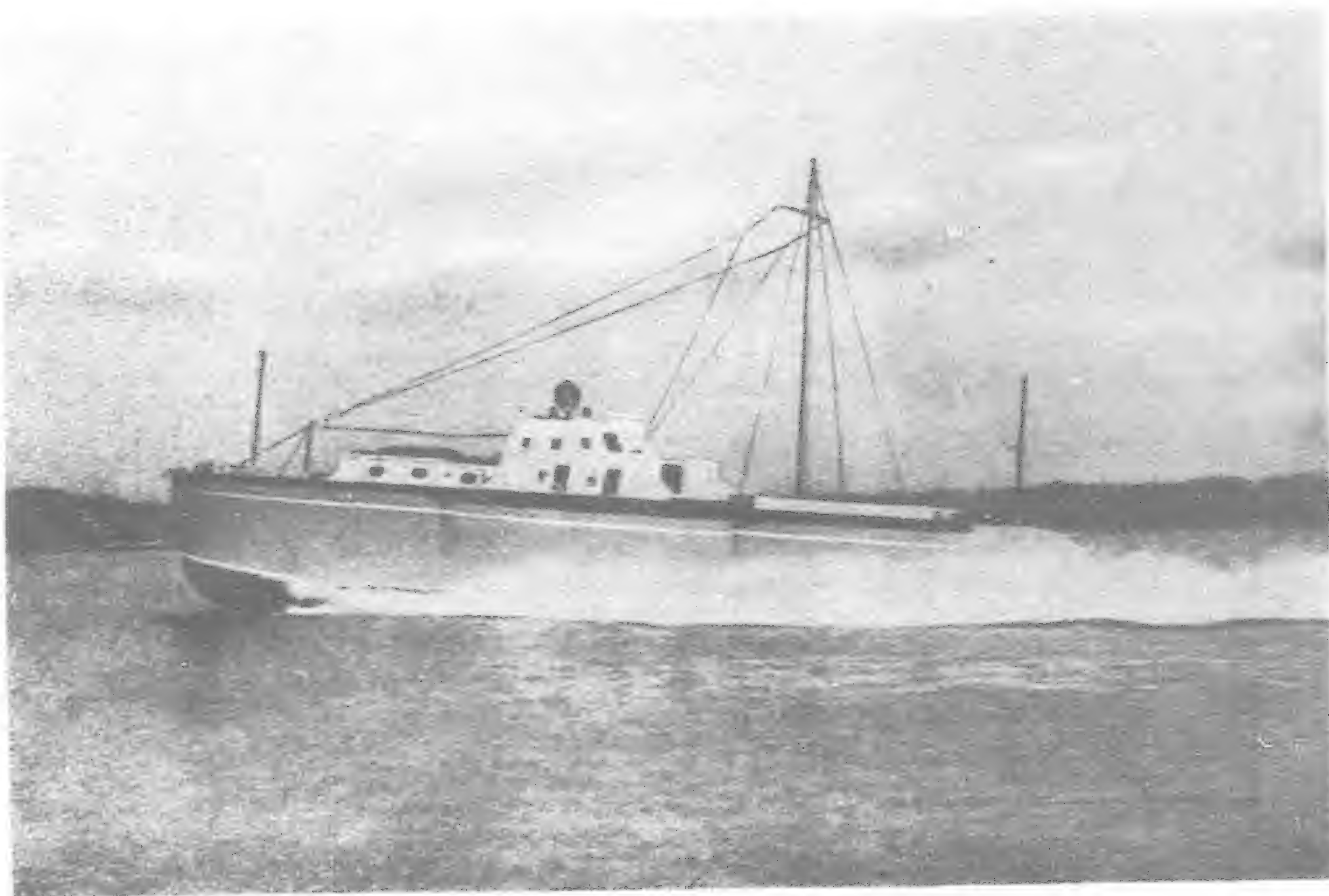
A boat which weighs but 5½ tons, is provided with well over two tons of armor plating, which can carry a further six tons, making a load of over eight tons in all, and which can maintain 28 m.p.h., represents something exceptional. But what is specially to be emphasized is that this craft has an astounding degree of seaworthiness, as has been demonstrated in the recent gales. It was an exactly similar hull (although the boat is built for other purposes) which made the trip recently from Southampton to Portsmouth in a gale when

the wind was blowing over 60 m.p.h. and very violent seas were encountered.

The *Kuan Wei* is 45-ft. in length, has a beam of 9-ft. 6-ins. and a draught of 2-ft. 4-ins. With her three Power engines, each designed to develop 100 b.h.p. at 3,000 r.p.m., she is capable of a speed of 30 m.p.h., or possibly a little over, and has a radius of action of 420 miles.

When running at about 20 m.p.h. to 22 m.p.h. the power required from the three engines is probably only about 150 b.h.p. Propulsive efficiency at high engine speed is evidently attainable with this design of hull.

For her somewhat dangerous service the *Kuan Wei* has to carry a crew of eight Chinese



The "Kuan Wei" on Trials



A Bow On View

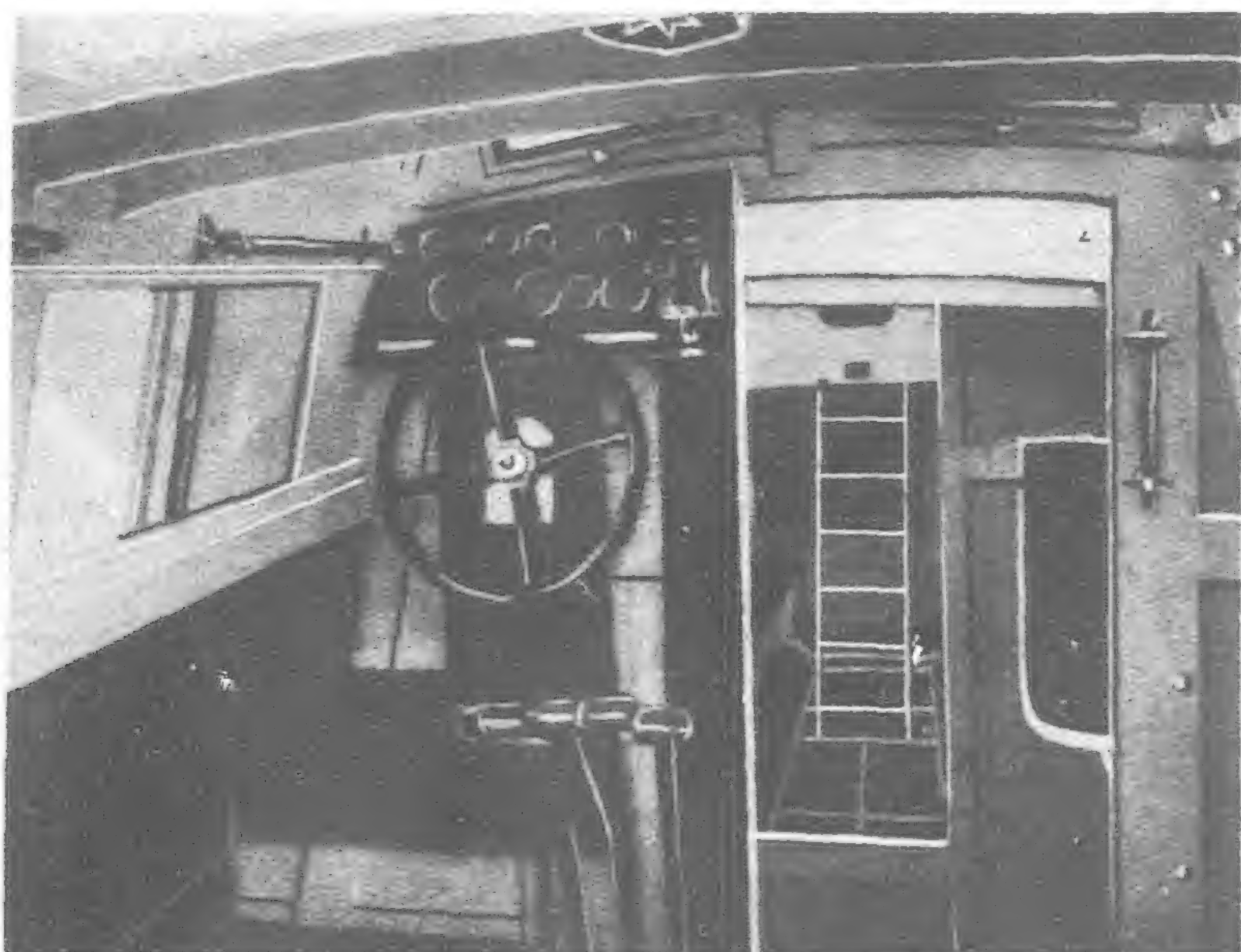


On Deck Looking Forward



Three-Quarters View showing Armor Plating Amidship

* The Motor Boat



Steering Wheel and Controls



Eight-berth compartment for Crew

and two European officers. Berths are therefore provided for the crew forward, the space available being quite ample. Aft of this is a lavatory to port and a dish-washing place to starboard. The door which leads from here to the steering or control compartment is of armored steel. This can be shut from the control side, so that should the crew feel disposed to mutiny they would find their plans frustrated.

The armor plating protecting the hull can be seen in the illustrations of the boat. It extends for a considerable length, protecting the control cabin (which is the living cabin for the officers), also the engine compartment immediately aft of it. The whole upper part of the control cabin is built up of steel, and the large opening windows can be completely or partly covered by slid-in panels of armor plate. Two of the four petrol tanks, carrying in all about 300 gallons, are under the seats in the control cabin and are thus protected, and all of the petrol runs by gravity to a central collecting tank, from which it is delivered to the engines.

In the cockpit aft of the engine compartment is a space for a cooking stove, and an awning can be erected here. Aft of this cockpit and under the deck is one of the petrol tanks, another being under the cockpit seat. Sufficient drinking water is carried to allow the boat to remain at sea for considerable periods.

Some of the special features of equipment are noteworthy. The large Marconi receiving and transmitting wireless set in the control cabin has a very wide range and there is a powerful search-light mounted on the cabin top.

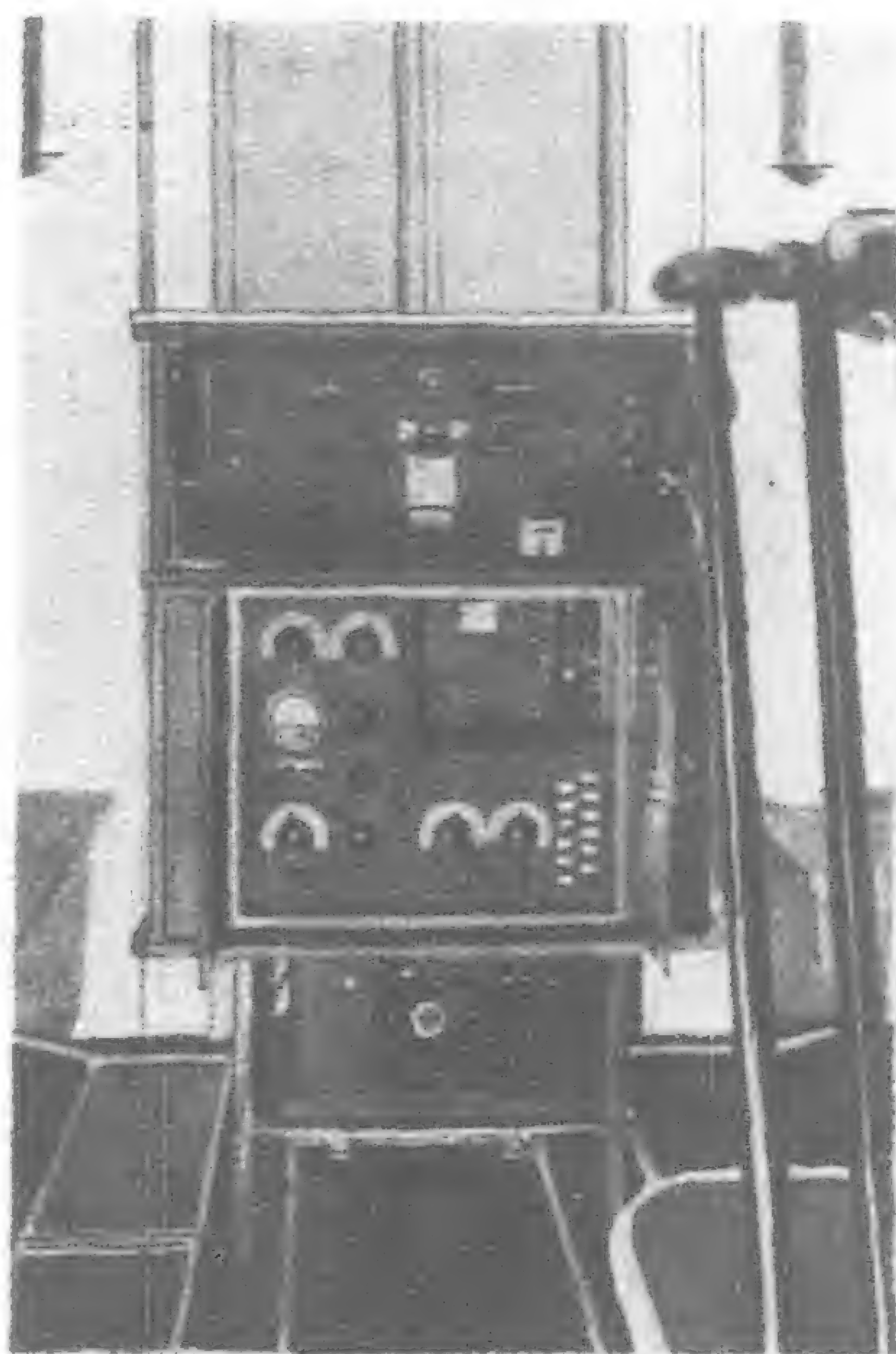
For the supply of electric current when the boat is at anchor a dynamo driven by a two-stroke petrol engine is installed in the engine compartment. The lighting throughout the boat is exceptionally good.

At any speed over 6 m.p.h. water is removed from the bilges by automatic self-balers in each compartment.

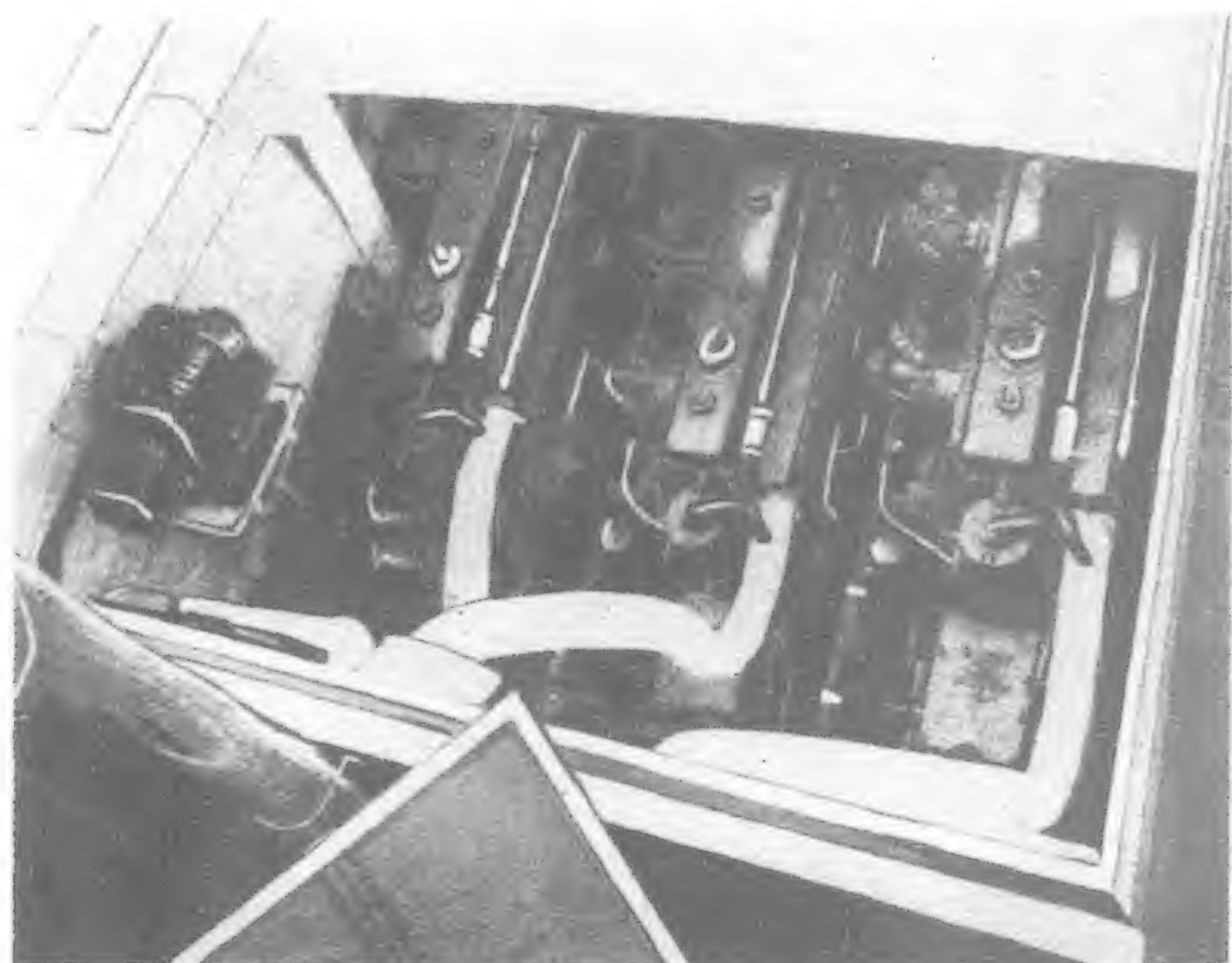
Close to the steering wheel in the control cabin are the three reverse levers and all the gauges and switches for the engines, each of which is provided with an electric starter. The three throttle levers are adjacent and can be operated together or separately, the

speed indicators on the instrument panel showing the revolutions.

A run in *Kuan Wei* with Mr. Scott-Paine, who is responsible for the design, revealed her flexibility and many other qualities. The sea was dead smooth, and whilst we could not have a demonstration of seaworthiness in rough water, we were able to see that under these conditions there was a complete absence of vibration of any sort. At 30 m.p.h. it was very difficult indeed to realize that any speed above 15 m.p.h. was being made unless some object on the shore was observed, and the smoothness of riding was remarkable.



Wireless Set



The three 100 h.p. Engines

We were well able to visualize some of the future possible developments of this type of craft, and we hope they will not be long delayed.

Engineers in Burma

According to the report of the University of Rangoon for 1933-34 arrangements have been made for courses for a Diploma in Mechanical and Electrical Engineering to replace the higher teaching at the Government Technical Institute, Insein.

These courses will be shorter and of lower standard than those for the B.Sc. degree examinations in Engineering. The Diploma is intended to be a qualification for posts of responsibility in engineering workshops—electrical undertakings and mines, and will train the type of men normally in demand by oil-producing firms for fields, installations, and refinery works. The courses will cover a total academic period of four years, after which the successful students will be posted out for a period of practical training.

The Nippon Yusen Kaisha New Cargo Boat *Noto Maru*

THE Nippon Yusen Kaisha, whose house flag is so familiar in seaports throughout the world, has never in its long existence shown lack of enterprise, and its confidence in the future of shipping was once again exemplified by its decision, at the beginning of the year before last, to build six high-speed motor cargo boats under the provisions of the Government Ship Quality Improvement Act, for its Orient-New York Line, with a view to improving considerably the service it maintains on that route.

Orders for three of the vessels under this scheme were placed with the Yokohama Dock Company & Uraga Dock Company, while the other three were ordered from the Nagasaki Shipyard of the Mitsubishi Jukogyo Kabushiki Kaisha.

It may be observed, in passing, that since the Osaka Shosen Kaisha allotted six newly-built vessels of their *Kinai Maru* class to the same run, with such excellent results, other owners have been prompted to follow the example and place new fast tonnage on that route. Under the circumstances, the six new vessels for the Nippon Yusen Kaisha will be such that they can compare most favorably with the vessels of any other owners in speed and in all other respects.

The *Noto Maru*, the first of the three vessels entrusted to the Mitsubishi Shipyard, was laid down on October 2, 1933, launched on May 1, and completed on October 15 last. She is of the same type as, and a sister ship to the second and third boats, the *Noshiro Maru* and the *Nojima Maru*.

Hull Department

The leading particulars of the vessel are as follows:—

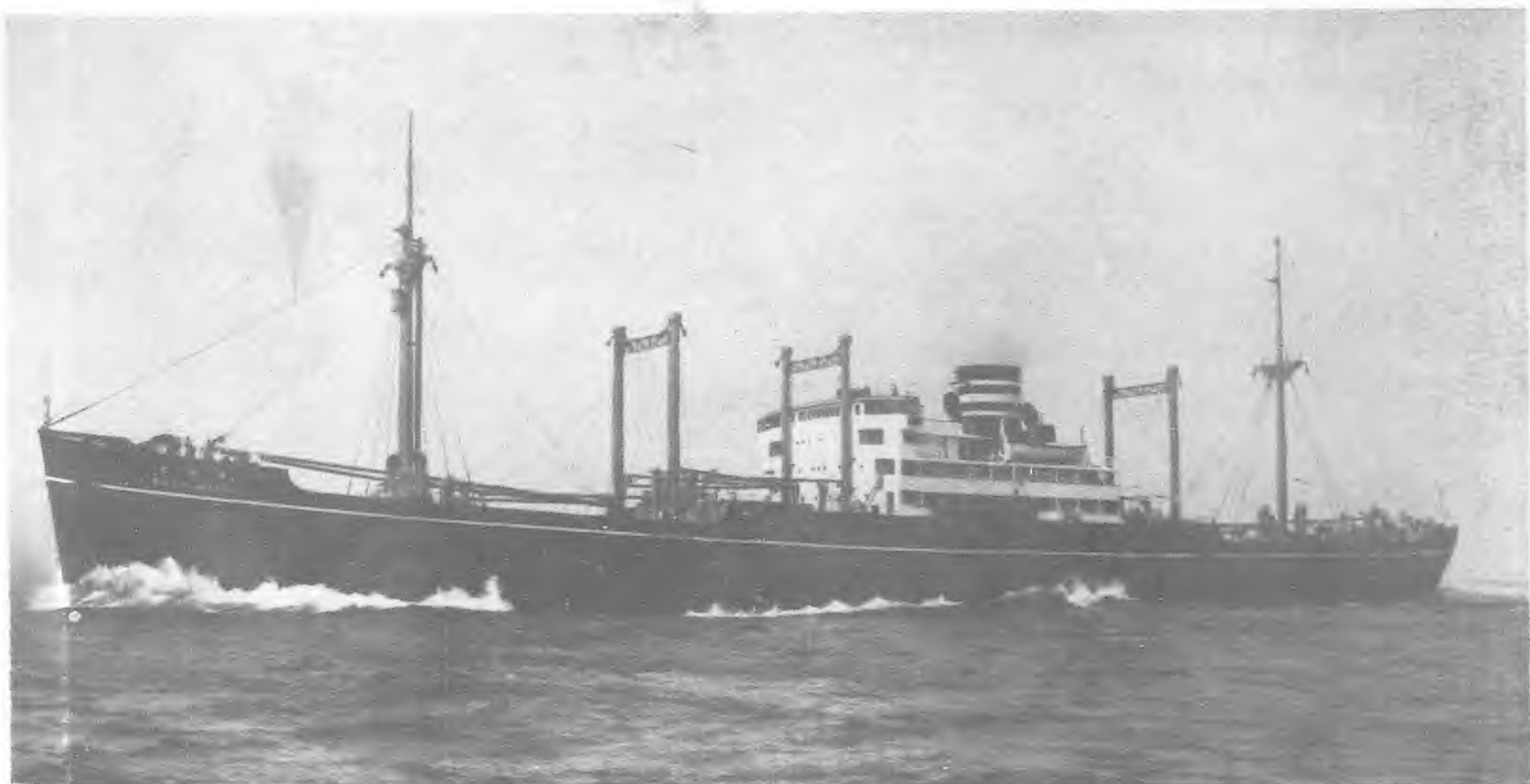
Length overall	143.5 meters
Length between perpendiculars	136.0 ..
Breadth moulded	19.0 ..
Depth moulded to upper deck	10.5 ..
Full load draught	8.42 ..
Gross tonnage	7,185
Net tonnage	4,318
Deadweight carrying capacity	9,840 tons
Cargo capacity	14,950 cubic meters
Speed (maximum attained during trial)	18.7 knots
Brake horse-power (normal)	6,700

The vessel has been constructed and equipped to conform to Teishinsho special survey, in accordance with the prescribed Ship-building Rules, Ship Inspection Law and Ship Load Line Law, and to the requirements of the highest class of Lloyd's Register under Special Survey for + 100 A.I., + L.M.C. and + Lloyd's R.M.C. She has two continuous decks, extending the full length of the vessel, with forecastle, bridge and poop decks. The stem is straight raked forward and the stern is of cruiser form. Her funnel is short, of large diameter, and she has two masts.

The form of the ship and her propeller were subjected to several exacting model tests in the experimental tank of the builders, with the result that a great improvement has been made in the ship's propulsive efficiency. Special care was paid to the stern frame, and a Mitsubishi balanced streamline rudder has been adopted.

Regarding the structure of the ship, in view of the high speed schedule which the vessel must maintain, and the large-powered double-acting engine installed, great precautions have been taken to prevent vibration, and, based on past experience, a careful scheme of construction has been incorporated, as a result of which no vibration was perceptible even during the high speed trial runs. The hull is divided by eight athwartship steel watertight bulkheads into six cargo holds, engine room and fore and aft peak tanks. The double bottom extends from the collision bulkhead to the aft peak bulkhead, and is given over to the storage of fresh water, fuel oil and ballast water. Fuel oil is also carried under No. 6 hold and in the engine room, to a total capacity of about 1,450 tons. No. 4 hold, which is allocated as a deep oil tank, is sectioned into four compartments, and is capable of storing 1,350 tons. Each hold is so constructed as to be suitable for carrying different kinds of cargo. There is, in addition, a refrigerated cargo space on the third 'tween deck of a capacity of 160 tons. For the transportation of silk, which is a most important cargo on this run, two rooms of a total capacity of 450 tons are provided on the fifth 'tween deck, and they are complete with heat and moisture-preventing arrangements. Two special cargo rooms and one mail room are provided in the poop deck and under the bridge deck respectively.

Not only have the Owners in mind to shorten the time required for actual voyaging by virtue of the high speed the ship can attain through her high-powered engine, but also the lessening of the time



The "*Noto Maru*" on her trial run

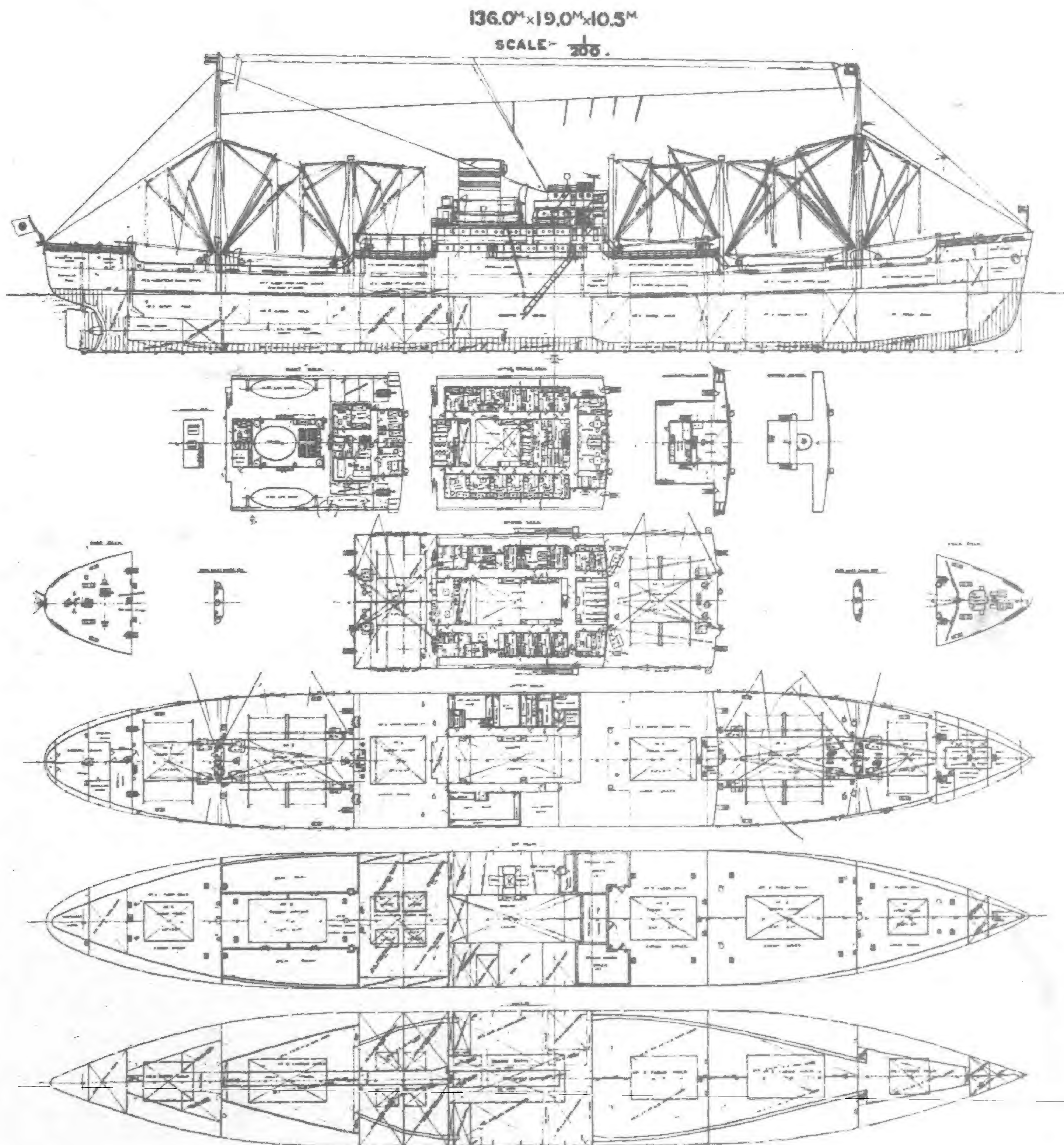
of her stay in ports, thus enabling the vessel to prove her superiority to the fullest extent. To this end, special attention has been devoted to her cargo handling appliances, which leave nothing to be desired. Some particulars of this equipment will without doubt be of interest.

The six holds each have a large hatch, and on the two masts and three pairs of derrick posts there are provided a total of 19 booms which are served by 18 electric winches, and so arranged as to afford safe and expeditious handling of cargo. The equipment for each hatch is as undernoted, viz :—

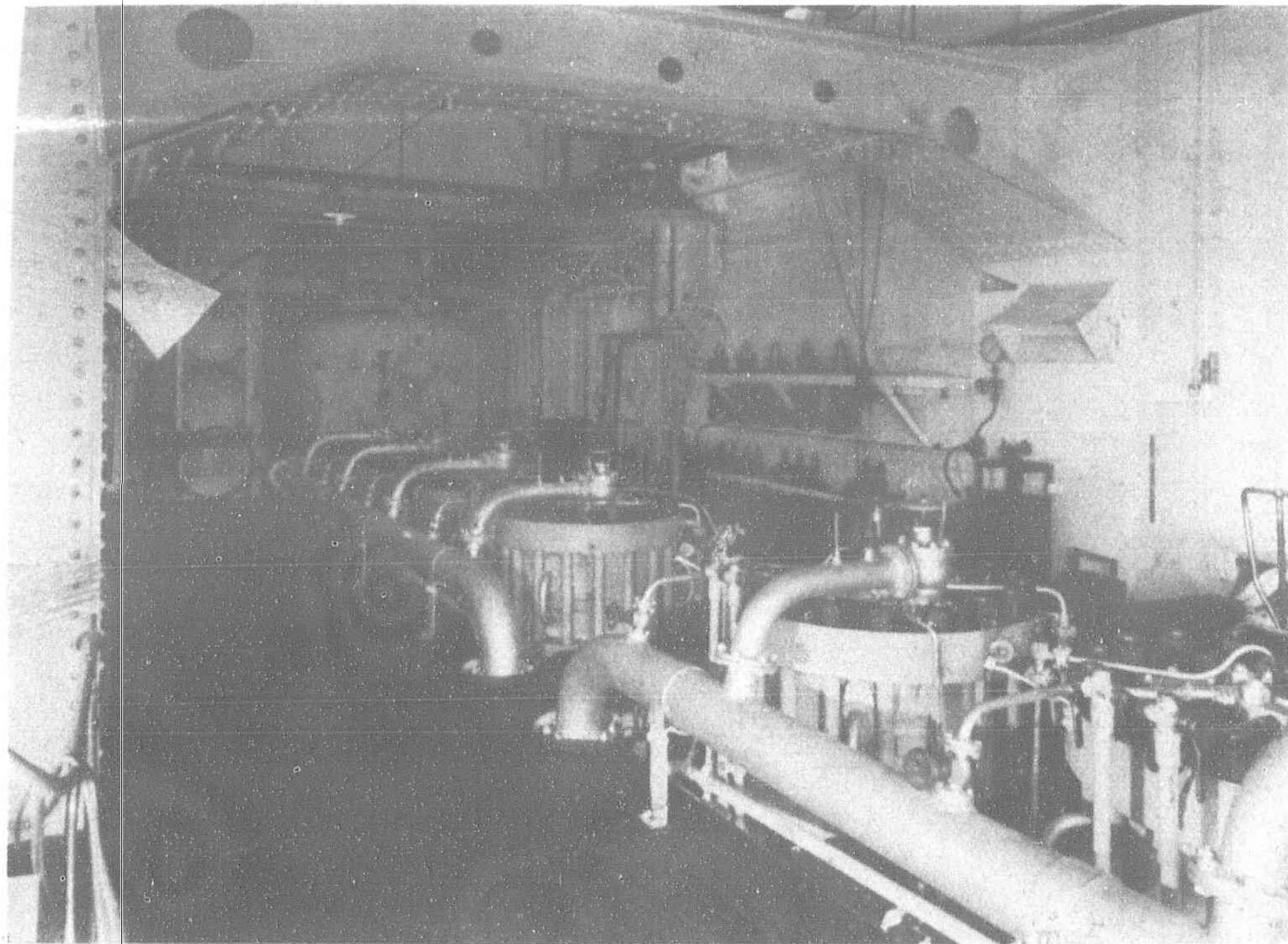
Hatch No.	Derricks	Winches
(1)	Two— 6 tons	Two—5 tons on foremast
(2)	Two—10 ,,	Two—5 ,, ,, ,,
	Two—10 ,, drums with 40 ton heavy derricks on foremast	
	Two— 3 tons	Two—3 tons on derrick post

Hatch No.	Derricks	Winches
(3)	Two— 6 tons	Two—3 tons on derrick post
	Two— 3 ,,	Two—3 ,, ,, ,, ,,
(4)	Two— 3 ,,	Two—3 ,, ,, ,, ,,
(5)	Two— 3 ,,	Two—3 ,, ,, ,, ,,
	Two—10 ,,	Two—5 ,, ,, main mast
(6)	Two— 6 ,,	Two—3 ,, ,, ,, ,,

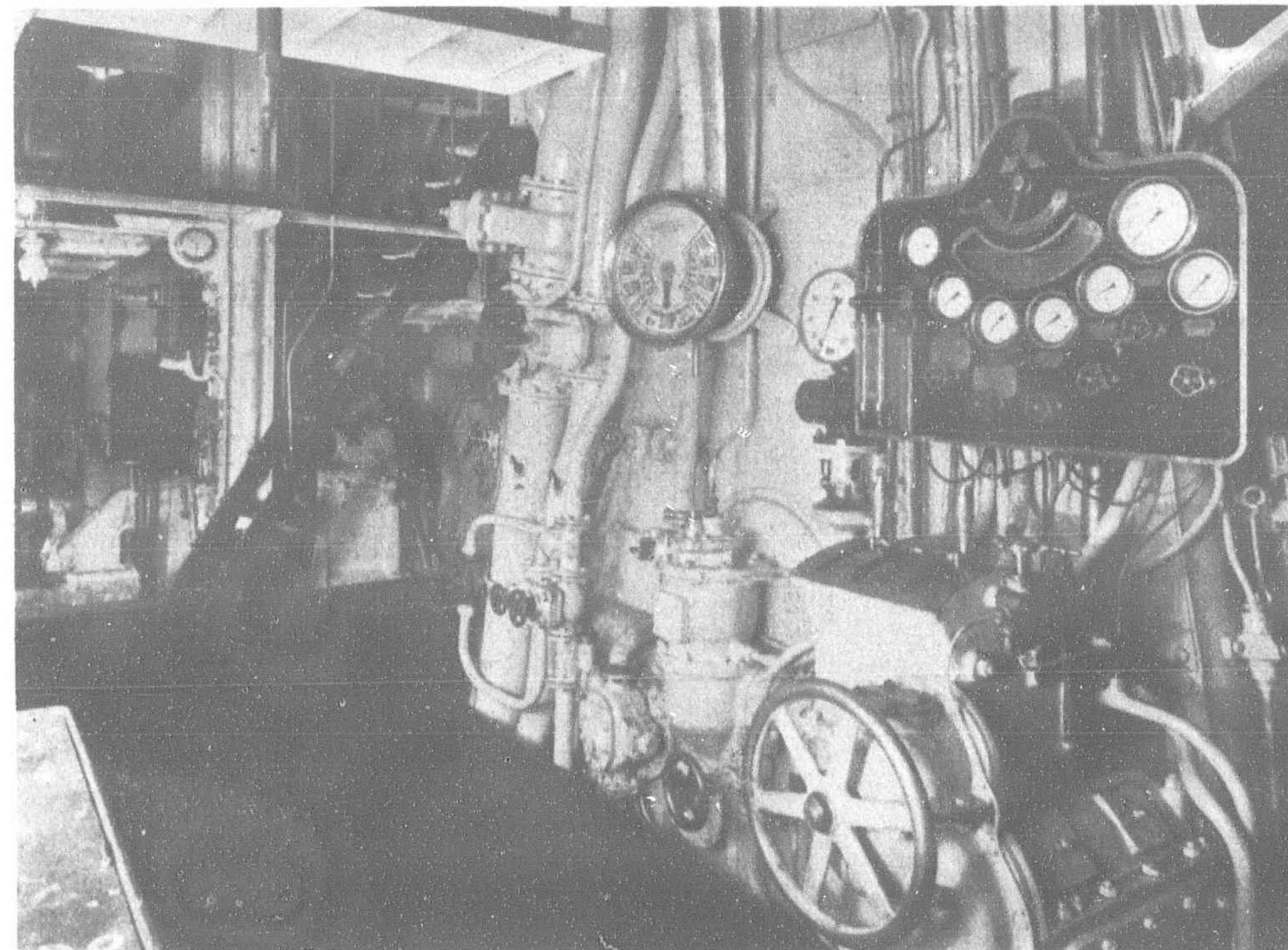
The electric winches are all of Mitsubishi Electrical Engineering Company's make. These winches have an established reputation for perfect operation and for facilitating the handling of cargo. To all cargo hatches on the weather deck Mitsubishi-Macanking patent steel hatch covers are fitted, and these are one of the specialties in connection with the cargo handling appliances on board worthy of mention. It will be gathered that the vessel possesses every possible facility for the expeditious handling of cargo, though



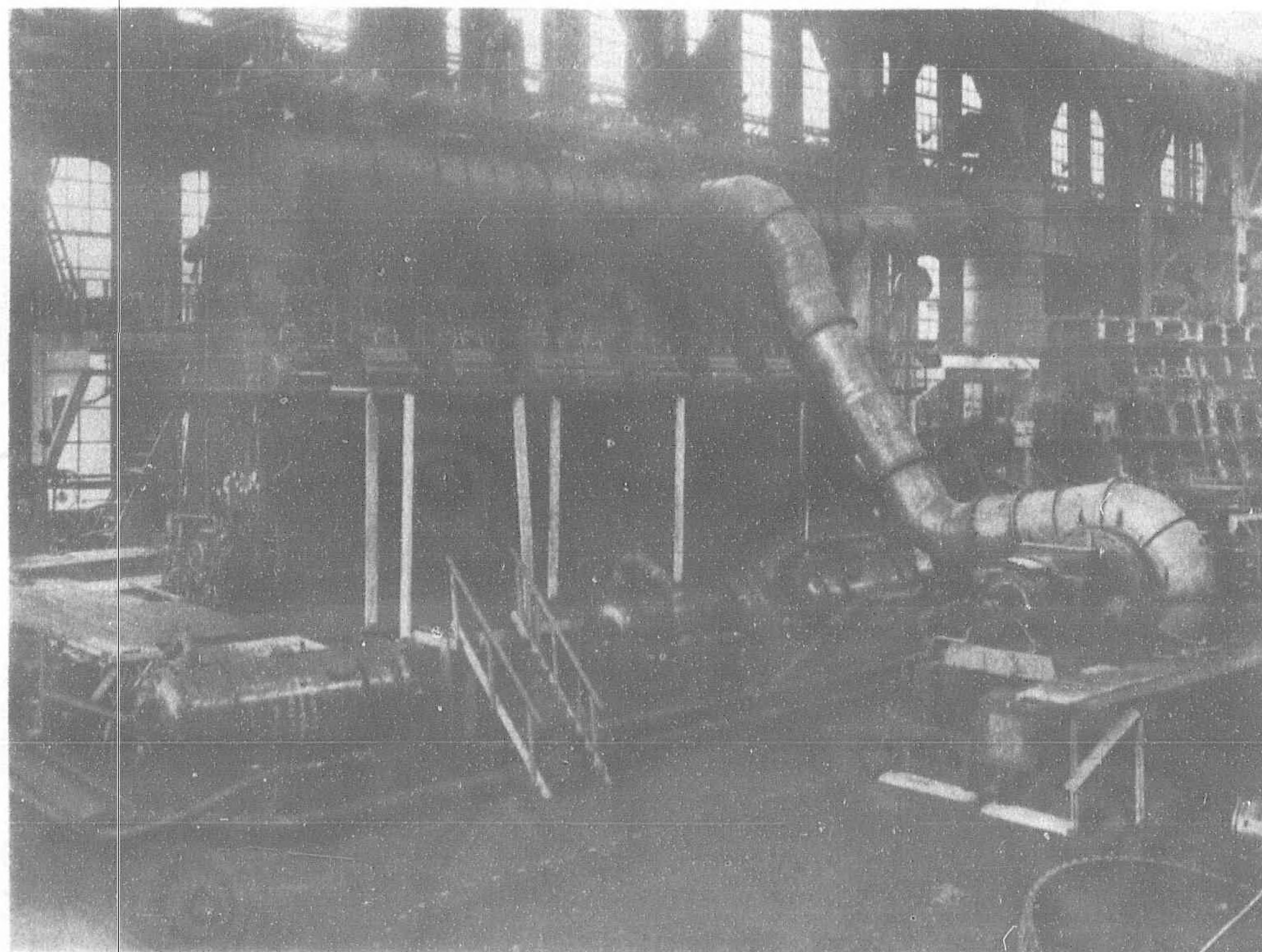
Showing general arrangement of the "Noto Maru"



Cylinder Cover and Exhaust Boiler



Main Engine showing Maneuvering Platform and 260 k.w. Dynamo Engine



Main Engine at Shop Trial



Cooling Water Pump, Lubricating Oil Pump and Oil Purifier

it may be mentioned that all her other equipments are on an equally high standard commensurate with the requirements of a superior up-to-date motor cargo vessel.

To cite a few cases, all cargo spaces and accommodation throughout are efficiently and adequately ventilated; and, in addition to natural ventilation, the exhaust system of mechanical ventilation is provided for Nos. 1 and 2 cargo holds, assigned for the conveyance of special cargo. Ordnance type fans of Mitsubishi make are installed in the fan engine rooms in the forecastle and bridge decks. As to fire detecting and extinguishing facilities, a complete Lux-Rich fire detecting and extinguishing system is installed for the protection of all cargo holds and 'tween decks, including the silk rooms and mail room, lamp room and paint store, etc., all in accordance with the latest requirements and recommendations of the New York Board of Underwriters and the United States Steamboat Inspection Service. Similarly to the electric winches, of which mention has been made already, other deck machinery is all home made, in the application of which a careful selection was made so that the best and most suitable apparatus was adopted. They comprise:—

Electric windlass, with control gear of the booster system, which was supplied by the Uraga Dock Company—the motor of 60 kw. being furnished by Mitsubishi Electrical Engineering Company, Limited.

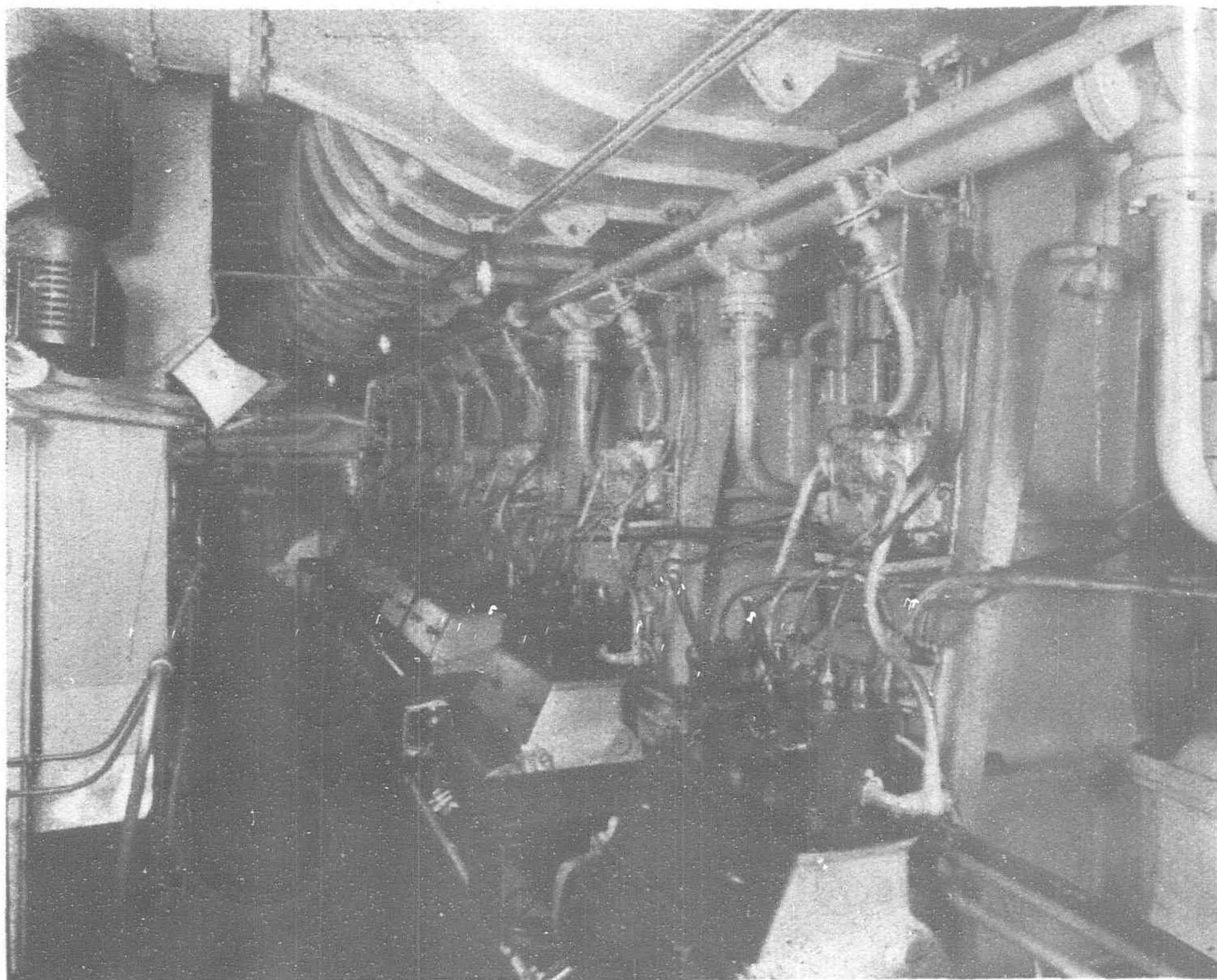
The steering gear is of the all-electric type, with a Leonard set, manufactured by Mitsubishi Electrical Engineering Company, Limited, having a motor of 12.3 kw. capacity.

The electric warping winch was also furnished by the Mitsubishi Electrical Engineering Company, Limited, and is capable of exerting a direct pull of 10 tons.

The refrigerating plant comprises two CO₂ refrigerating machines, each of 60,000 B.T.U's. This was supplied by the Kobe Shipyard & Engine Works of the Builders.

Rat-proof construction. The vessel is constructed rat-proof, in accordance with the general instructions issued by the U.S. Public Health Service, thus entirely eliminating rodents throughout the ship, viz., in cabins, holds, stores and other spaces, and completely overcoming the annoyance from such pests as is experienced in many ships.

Officers and engineers, whether of senior or junior rank, are all quartered amidships in deck houses, their cabins being roomy, well furnished, admitting adequate supplies of fresh air and light, and



Main Engine Fuel Oil Pump

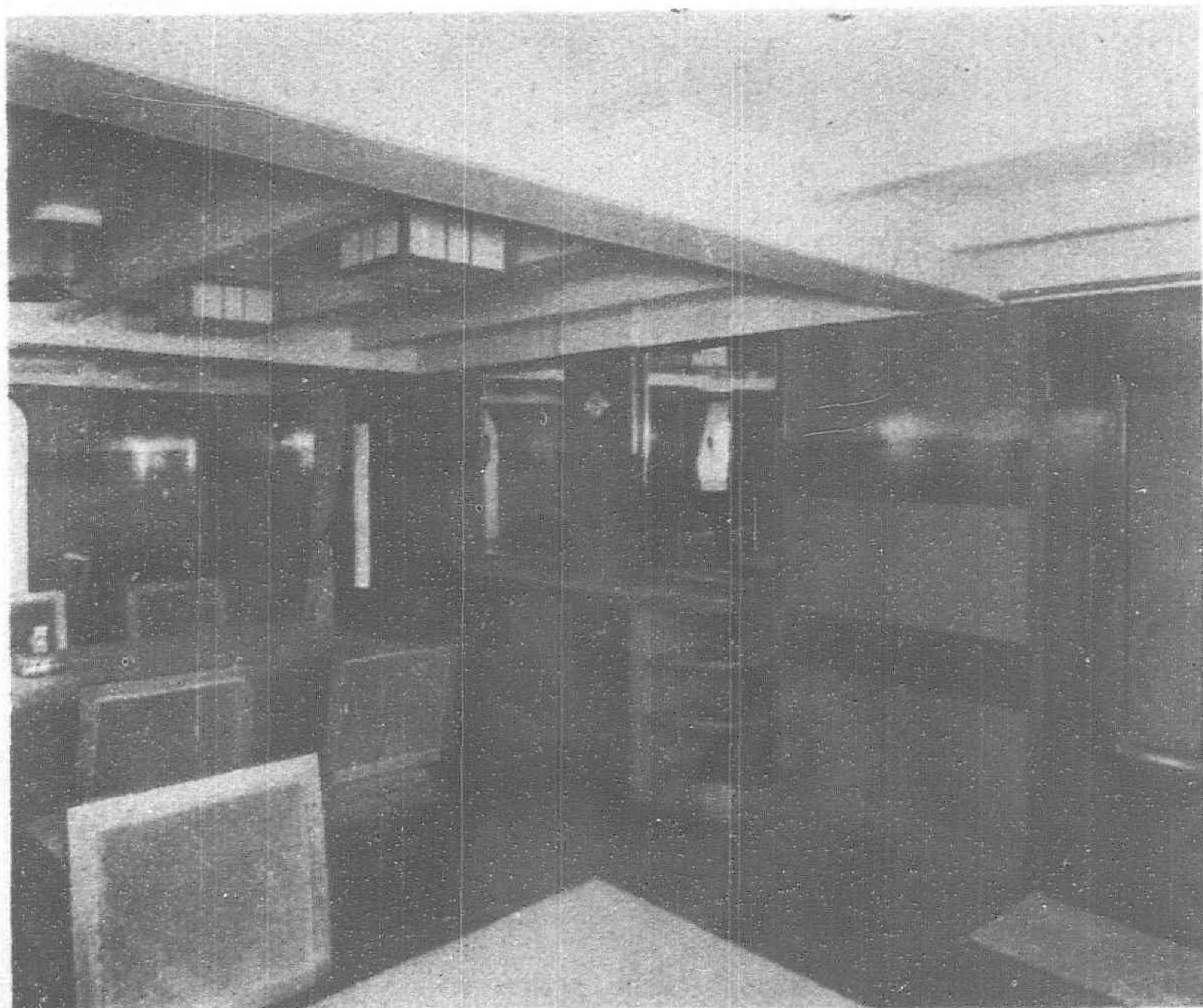
fitted out with a view to affording the maximum amount of comfort, on a standard rarely to be met with in any cargo boats, following the usual practice of the Owners in their solicitude for the welfare of their officers. Subordinate crews' rooms are also laid out on the same high standard as that stated above for the officers and engineers, having spacious common mess-room and well equipped baths and lavatories.

The dining-saloon is located forward on the upper bridge deck, furnished and arranged in modern Japanese style.

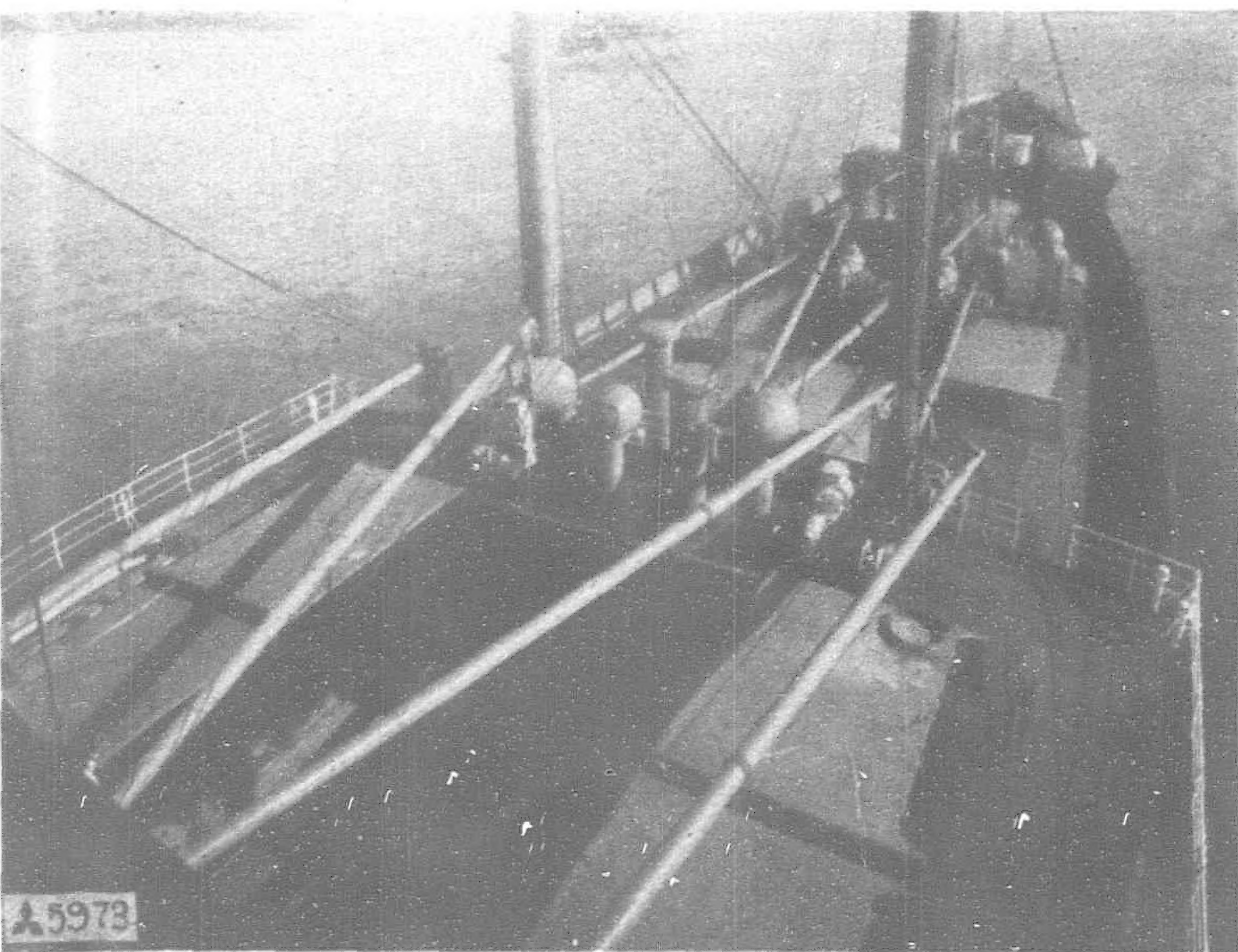
Two state rooms are on the boat deck, each having two beds and Simmonds' type box spring mattresses. Other furniture and fittings are all in harmony with the scheme of lay-out adopted, and engender a feeling of quite similar elegance and comfort as is to be found in modern ocean going passenger liners.

Electric Installation

This vessel is fitted out in the most up-to-date fashion with the electric installation all home made.



Two different views of the Saloon of the "Noto Maru"



The Mitsubishi Mecanking Steel Hatch Cover of the "Noto Maru"

There are three Diesel-driven D.C. generators each having a capacity of 260 kw. 225-volts, and one auxiliary generating set of 20 kw., D.C. 225-volts for the supply of electric power for deck machinery and engine room auxiliaries, wireless telegraphy, etc.

The number of electric machines is 32 sets, totalling 975 h.p., on deck and 30 sets, 1,350 h.p. in the engine room, including electric windlass of the Booster System, which is one of the largest units of its kind ever fitted on board a Japanese merchant vessel, and also electric steering gear; the electrical parts of all these machines were manufactured by the Mitsubishi Electrical Engineering Company, Limited. Direction finder, loud speaking telephone, helm indicator and other electric equipments are also provided.

Particulars of Machinery

The main engine comprises one set of Mitsubishi-Sulzer double-acting, two-cycle airless injection Diesel, with seven working cylinders of 700 mm. bore, 1,200 mm. stroke, capable of developing a normal output of 6,700 b.h.p. at 106 r.p.m. This engine is the third of its kind to be constructed at the Nagasaki Shipyard & Engine Works of the Mitsubishi Jukogyo Kabushiki Kaisha and fitted in merchant vessels, the first and second being those installed, and giving excellent results, in the *Kano Maru* and the *Kiyozumi Maru* of the Kokusai Kisen Kaisha. This engine, however, has a bore of 700 mm. as against 760 in the former two engines, besides having an independent turbo-blower instead of a reciprocating pump for scavenging as is employed in the former two engines.

The constructional details are quite similar in these three engines, but many improvements have been incorporated in the *Noto Maru* engine from the experience gained with the *Kiyozumi Maru* engine.

THE SCAVENGING AIR BLOWER.—Scavenging air is supplied by an independent electrically-driven turbo-blower of the Mitsubishi double-drive type, having a suction capacity of about 975 cub.m. of free air per minute, with a delivery pressure of 1,290 mm. of water column. The turbo-blower is fitted with two motors, one being for emergency use.

COOLING WATER ARRANGEMENTS.—The cylinders, cylinder covers and pistons are cooled by fresh water, and the units for supplying such are as follows :—

- 2—Jacket and piston cooling fresh water pumps, each of a capacity of 300/80 cubic meters per hour and a respective pressure of 2.5/4.8 kg. per sq. m.
- 2—Sea water circulating pumps, having a capacity of 430 cub. meters per hour at a pressure of 2.5 kg. per sq. cm.
- 1—Piston cooling water cooler having a cooling surface of 195 sq. m.
- 2—Jacket cooling water coolers, each having a cooling surface of 195 sq. m.

LUBRICATING OIL UNITS.—The lubricating oil for the main engine is supplied by two independent electrically-driven pumps, one being spare, and the outfit includes, among others :—

- 2—Lubricating oil pumps, each having a capacity of 65 cubic meters per hour at a pressure of 3.5 kg. per sq. cm.
- 2—Main lubricating oil coolers, each having a cooling surface of 25 sq. meters.

STARTING AIR ARRANGEMENTS.—The main engine is started by compressed air, and among the machinery for this purpose is—

- 2—Starting air reservoirs of 15 cub. m. capacity, at a pressure of 30 kg. per sq. cm.
- 2—Manœuvring air compressors (driven by the main generating set) of the three-stage Mitsubishi-Sulzer type 1C36, having a capacity of 290 cub.m. per hour against a delivery pressure of 30 kg. per sq. m.

Trial Results

The official trials of the vessel were conducted on September 29 and October 2 last, near Nagasaki. The main engine gave an excellent performance throughout the various trials, and the results recorded are shown on the table attached, from which it will be observed that a maximum speed of 18.801 knots was obtained on the light load draught full speed trial, with a mean of 18.534 knots, and a mean of 17.246 knots on the half-load draught full power trial, thus not only far exceeding the guaranteed speed but showing an ample margin of reserve.

Huai River Conservancy

Strenuous efforts are being made by the Kiangsu provincial authorities for the conservancy of the Huai River, which has worked constant havoc in the province in the past. Funds amounting to \$7,000,000 have been raised and 160,000 workers enlisted for the purpose. It is estimated that, upon the completion of the task, about 5,000,000 *mow* of fertile land will have been reclaimed.

Of the total conservancy funds an amount of \$5,000,000 is understood to have been loaned from the Sino-British Boxer Indemnity Fund, while the remainder amount is to be raised by Conservancy bonds.

The first stage of the work centers upon improving the channel between Yangchuangchen, Huaiyin, and Taotzekou, for a total distance of 170 kilometers. The upper reaches will follow the old bed of the Yellow River, but for the lower part a new outlet channel to the sea will be dredged.—*Central News*.

Power Plants in Ceylon

Work in connection with establishing power substations at Kandana and Jaela for extended electricity service is now in progress.

The high tension main from the Kolonnawa Power Station supplying Negombo is to be utilized for branch services.

From Kelaniya the power circuit is being laid to Peliyagoda where it would replace the existing oil engine plant of the Peliyagoda Sanitary Board.

From Peliyagoda the line follows the Colombo-Negombo road up to Wattala junction, a distance of about two miles, serving *en route* oil mills alongside the high road.

In addition to lighting Wattala Sanitary Board Town, the main travels along the Hekitta Road to the Leper Asylum at Hendela where the entire hospital would be served with electricity.

Thereafter the main would be conducted along the road which now exists by the old Negombo canal, known as the Hamilton Canal, for a distance of about two miles to serve the existing fibre mills and also the fibre mills under construction, the chief of which is a modern plant with electric motive power erected by Messrs. C. S. Anthony and Co.

The introduction of electricity in these parts, in addition to being an asset to industrial activity, is hailed as a boon to the inhabitants of the area.

For the area is rapidly developing since the widening of the Colombo-Negombo road, and the Kelaniya North Flood Protection Scheme.

Engineering Notes

RAILWAYS

CHINA'S RAILWAYS.—The Chinese National Railway Association, in a session of three days, adopted a total of over forty resolutions. The more important of the resolutions related to the employment of technical experts by the railway administrations; the construction of a railway to link up Sian, provincial capital of Shensi, with Ili in Sinkiang, and the completion of the main railway lines in the North-west by the Ministry of Railways.

RAILWAY IN KIANGSI.—The Chinese Government has contracted with a Sino-German group for the construction of 300 kilometers of railway between Yueshan and Nanchang. The project is to be completed by 1936. The group was also granted an option on construction of an additional 300 miles of railway from Nanchang to Pinghsiang. The group comprises the German iron firm, Otto Wolff, and a number of Chinese banks headed by the Bank of China. All construction material and rolling stock must be of German manufacture.

PLACES BIG ORDER.—The Chinese Government Purchasing Commission, says "Modern Transport" have given contracts to Messrs. G. R. Turner, Ltd., of Langley Mill, Notts., for twenty-five 40 ton all-steel high-sided wagons. They have also placed with the Metropolitan-Cammell Carriage, Wagon, and Finance Company, Ltd., of Birmingham, for ten 40 ton all-steel bogie-covered goods wagons for the Canton-Hankow Railway, and with the Horsley Bridge and Thomas Piggott, Ltd., Tipton, Staffs, for four steel water tanks, two of 30,000 gallons capacity, and two of 10,000 gallons capacity, all with supporting steelwork.

NEW NANKING STATION.—The sum of \$190,000 has been allotted by the Ministry of Railways towards the construction of the Central Railway Station in Nanking. Two warehouses will be built at the station for goods storage, one for the Nanking-Shanghai Railway and the other for through traffic service. Three pairs of tracks will be laid in order to facilitate transportation at the station.

NEW RAILWAY.—The long railway in Shansi, from Tatung in the north to Puchow in the south, a distance of over 840 kilometers, has been opened to traffic, the total expenditure being estimated at about \$15,120,000. A number of other railways are planned, the most important being the Taiyuan-Hsinghsien line, about 260 kilometers in length. Two routes have been surveyed, one from Hokouchin to Hsinghsien and the other from Shinshien on the Tatung-Puchow railway to Hsinghsien, the latter being about 40 kilometers shorter than the former, but the former having the advantage of lower gradients. Other lines to be built are mostly branches of the Tatung-Puchow railway on various sections.

MINING

URANIUM IN KIRGHIZIA.—New deposits of uranium-vanadium bearing ores were recently discovered 69 kilometers north of Andizhan in Kirghizia. The thickness of the ore-bearing vein is about one meter and its length about 250 meters. The discovery of such ores in Central Asia is considered of especial significance as indicating the possibility of further finds of this nature.

NEW GRAPHITE PLANT.—Construction of a new graphite plant at Zavaliev, in the Ukraine, was completed on November 1. The plant is one of the largest of its kind in the world.

OIL NEAR STALINABAD.—The Central Asiatic Geological Survey Commission recently discovered large oil deposits 30 kilometers from Stalinabad, in Tadzhikistan. The oil-bearing district covers an area of 56 square kilometers.

OIL GUSHER IN BAKU.—On November 14 an oil gusher producing six to seven thousand tons of oil daily was brought in at Baku. The oil was brought up from a depth of 1,300 meters, the seventeenth stratum of the Baku fields. It had previously been believed that the seventeenth layer contained only gas.

COAL NEAR LAKE BALKHASH.—In connection with hydro-geological surveys for the Karaganda-Balkhashstroi railway, geologists recently discovered considerable deposits of coal near Bosagi. A vein four meters in thickness was uncovered. A huge copper smelter is under construction in this district.

ORES IN DONETZ BASIN.—The geological commission of the Ukrainian Academy of Science recently announced important discoveries of valuable metallic ores in the Donetz Basin. In the Central and Esaul regions 21 zinc, silver and lead-bearing ore seams, varying in thickness from 20 to 40 centimeters, were discovered. At Ostri Burg 30 new gold-bearing veins were uncovered.

SULZER

BROTHERS

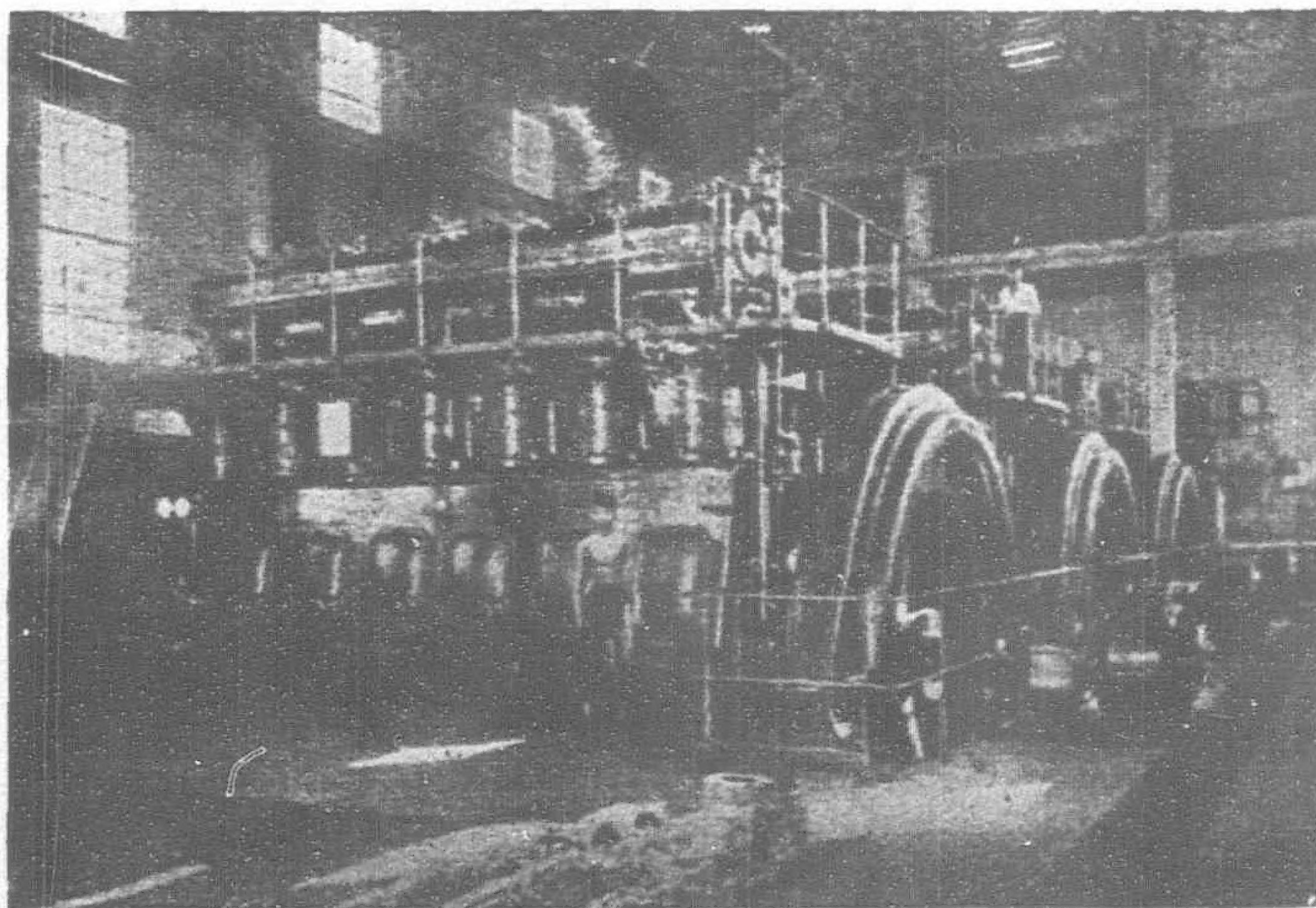
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